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# CAL POLY

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1986-88 CATALOG  
ANNOUNCEMENTS

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## California Polytechnic State University San Luis Obispo, CA 93407

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# California Polytechnic State University

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San Luis Obispo

**1986-88 CATALOG**

Copies of the *Catalog* may be purchased at the El Corral Bookstore (805 546-2838) or ordered by mail. The price per copy is \$4.00 (including tax). For mail orders add \$2.00 to the check or money order to cover the cost of handling and mailing. The quarterly *Class Schedule* is also available at the El Corral Bookstore.

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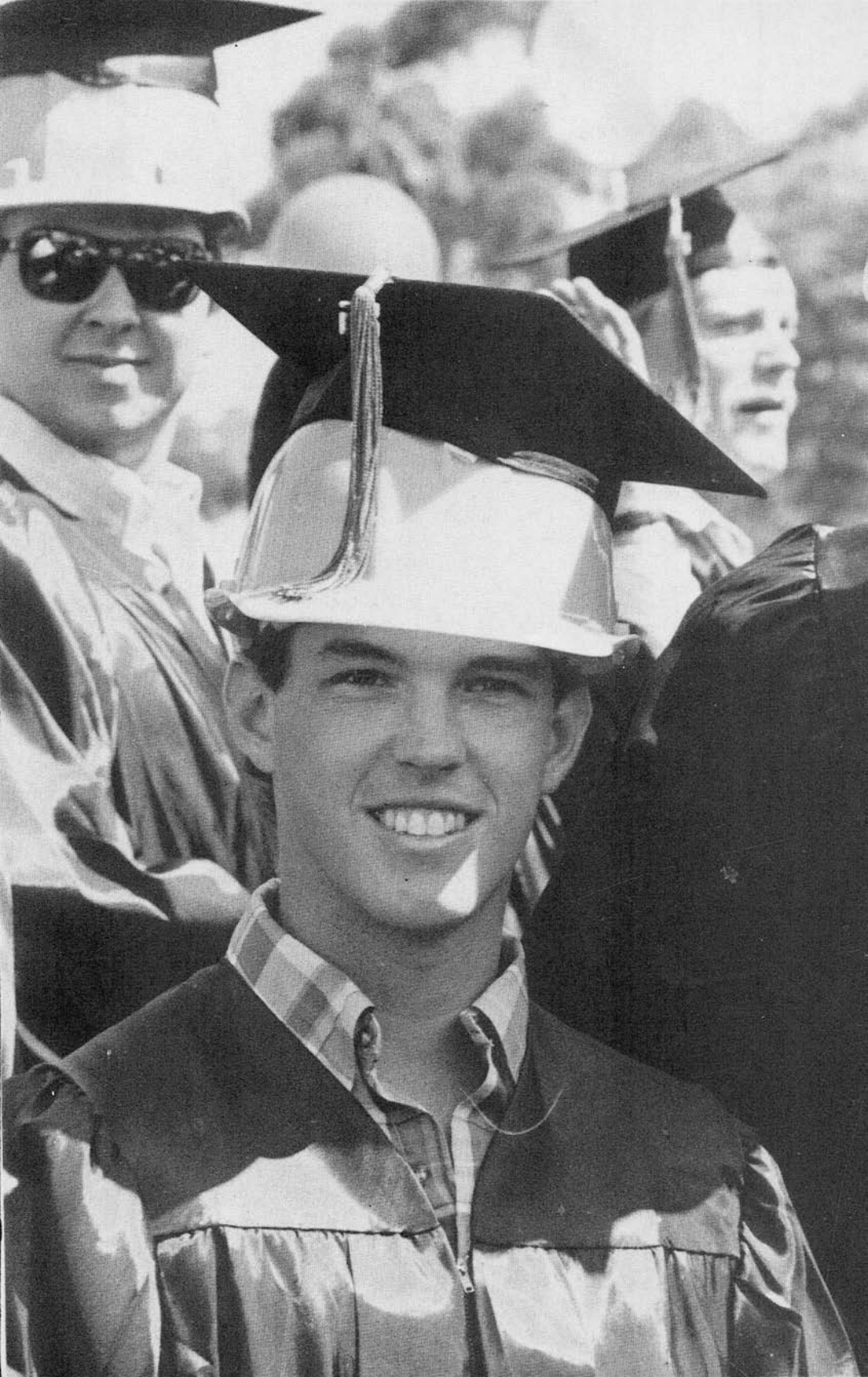
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# ACADEMIC CALENDAR

# 1986-1988

Please note: This is not intended to be construed as an employee work calendar.

## SUMMER QUARTER 1986

June 18	Wednesday	Beginning of university year Beginning of summer quarter Summer quarter classes begin
July 1	Tuesday	End of second week of instruction Last day to drop a class
July 2	Wednesday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
July 4	Friday	Academic holiday—Independence Day
July 9	Wednesday	End of third week of instruction Census date
August 6	Wednesday	End of seventh week of instruction
August 25	Monday	Last day of classes
August 26-29	Tuesday-Friday	Final examination period
August 29	Friday	End of summer quarter
August 30- September 14	Saturday-Sunday	Academic holiday

## FALL QUARTER 1986

September 15	Monday	Beginning of fall quarter (faculty only)
September 22	Monday	Fall quarter classes begin
October 3	Friday	End of second week of instruction Last day to drop a class
October 6	Monday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
October 10	Friday	End of third week of instruction Census date
November 7	Friday	End of seventh week of instruction
November 11	Tuesday	Academic holiday—Veterans' Day
November 26-30	Wednesday-Sunday	Academic holiday—Thanksgiving
December 5	Friday	Last day of classes
December 8-12	Monday-Friday	Final examination period
December 13	Saturday	Mid-Year Commencement
December 14- January 4	Sunday-Sunday	End of fall quarter Academic holiday

## WINTER QUARTER 1987

January 5	Monday	Beginning of winter quarter Winter quarter classes begin
January 16	Friday	End of second week of instruction Last day to drop a class
January 19	Monday	Academic holiday—Martin Luther King, Jr. Birthday Observance
January 20	Tuesday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
January 26	Monday	End of third week of instruction Census date
February 16	Monday	Academic holiday—George Washington's Birthday Observance
February 24	Tuesday	End of seventh week of instruction
March 13	Friday	Last day of classes
March 16-20	Monday-Friday	Final examination period
March 20	Friday	End of winter quarter
March 21-29	Saturday-Sunday	Academic holiday



## 8 Academic Calendar

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### SPRING QUARTER 1987

March 30	Monday	Beginning of spring quarter Spring quarter classes begin
April 10	Friday	End of second week of instruction Last day to drop a class
April 13	Monday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
April 17	Friday	End of third week of instruction Census date
May 8	Friday	End of seventh week of instruction
May 25	Monday	Academic holiday—Memorial Day
June 5	Friday	Last day of classes
June 8–12	Monday–Friday	Final examination period
June 13	Saturday	Commencement End of spring quarter End of university year (faculty only)
June 14–21	Sunday–Sunday	Academic holiday

### SUMMER QUARTER 1987

June 22	Monday	Beginning of university year Beginning of summer quarter Summer quarter classes begin
July 3	Friday	Academic holiday—Independence Day Observance
July 6	Monday	End of second week of instruction Last day to drop a class
July 7	Tuesday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
July 13	Monday	End of third week of instruction Census date
August 10	Monday	End of seventh week of instruction
August 28	Friday	Last day of classes
August 31– September 4	Monday–Friday	Final examination period
September 4	Friday	End of summer quarter
September 5–13	Saturday–Sunday	Academic holiday

### FALL QUARTER 1987

September 14	Monday	Beginning of fall quarter (faculty only)
September 21	Monday	Fall quarter classes begin
October 2	Friday	End of second week of instruction Last day to drop a class
October 5	Monday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
October 9	Friday	End of third week of instruction Census date
November 6	Friday	End of seventh week of instruction
November 11	Wednesday	Academic holiday—Veterans' Day
November 25–29	Wednesday–Sunday	Academic holiday—Thanksgiving
December 4	Friday	Last day of classes
December 7–11	Monday–Friday	Final examination period
December 12	Saturday	Mid-Year Commencement End of fall quarter
December 13– January 3	Sunday–Sunday	Academic holiday

**WINTER QUARTER 1988**

January 4	Monday	Beginning of winter quarter Winter quarter classes begin
January 15	Friday	End of second week of instruction Last day to drop a class
January 18	Monday	Academic holiday—Martin Luther King, Jr. Birthday Observance
January 19	Tuesday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
January 25	Monday	End of third week of instruction Census date
February 15	Monday	Academic holiday—George Washington's Birthday Observance
February 23	Tuesday	End of seventh week of instruction
March 11	Friday	Last day of classes
March 14–18	Monday–Friday	Final examination period
March 18	Friday	End of winter quarter
March 19–27	Saturday–Sunday	Academic holiday

**SPRING QUARTER 1988**

March 28	Monday	Beginning of spring quarter Spring quarter classes begin
April 8	Friday	End of second week of instruction Last day to drop a class
April 11	Monday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
April 15	Friday	End of third week of instruction Census date
May 13	Friday	End of seventh week of instruction
May 30	Monday	Academic holiday—Memorial Day
June 3	Friday	Last day of classes
June 6–10	Monday–Friday	Final examination period
June 11	Saturday	Commencement End of spring quarter End of university year (faculty only)
June 12–19	Sunday–Sunday	Academic holiday

**SUMMER QUARTER 1988**

June 20	Monday	Beginning of university year Beginning of summer quarter Summer quarter classes begin
July 1	Friday	End of second week of instruction Last day to drop a class
July 4	Monday	Academic holiday—Independence Day
July 5	Tuesday	Last day to add a class and to submit add/drop forms Last day to register late and pay late registration fee
July 11	Monday	End of third week of instruction Census date
August 8	Monday	End of seventh week of instruction
August 26	Friday	Last day of classes
August 29– September 2	Monday–Friday	Final examination period
September 2	Friday	End of summer quarter
September 3–11	Saturday–Sunday	Academic Holiday

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# THE CALIFORNIA STATE UNIVERSITY

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## THE CALIFORNIA STATE UNIVERSITY

The individual California State Colleges were brought together as a system by the Donahoe Higher Education Act of 1960. In 1972 the system became The California State University and Colleges and in 1982 the system became The California State University. Today, 18 of the 19 campuses have the title "university."

The oldest campus—San Jose State University—was founded as a Normal School in 1857 and became the first institution of public higher education in California. The newest campus—California State College, Bakersfield—began instruction in 1970.

Responsibility for The California State University is vested in the Board of Trustees, whose members are appointed by the Governor. The Trustees appoint the Chancellor, who is the chief executive officer of the system, and the Presidents, who are the chief executive officers on the respective campuses.

The Trustees, the Chancellor, and the Presidents develop systemwide policy, with actual implementation at the campus level taking place through broadly based consultative procedures. The Academic Senate of The California State University, made up of elected representatives of the faculty from each campus, recommends academic policy to the Board of Trustees through the Chancellor.

Academic excellence has been achieved by The California State University through a distinguished faculty, whose primary responsibility is superior teaching. While each campus in the system has its own unique geographic and curricular character, all campuses, as multipurpose institutions, offer undergraduate and graduate instruction for professional and occupational goals as well as broad liberal education. All of the campuses require for graduation a basic program of "General Education—Breadth Requirements" regardless of the type of bachelor's degree or major field selected by the student.

The CSU offers more than 1,500 bachelor's and master's degree programs in some 200 subject areas. Many of these programs are offered so that students can complete all upper-division and graduate requirements by part-time late afternoon and evening study. In addition, a variety of teaching and school service credential programs are available. A limited number of doctoral degrees are offered jointly with the University of California and with private institutions in California.

The Consortium of the CSU draws on the resources of the 19 campuses to offer regional and statewide off-campus degree, certificate, and credential programs to individuals who find it difficult or impossible to attend classes on a campus. In addition to Consortium programs, individual campuses also offer external degree programs.

System enrollments total approximately 316,000 students, who are taught by a faculty of 18,700. Last year the system awarded over 50 percent of the bachelor's degrees and 30 percent of the master's degrees granted in California. More than one million persons have been graduated from the 19 campuses since 1960.

## TRUSTEES OF THE CALIFORNIA STATE UNIVERSITY

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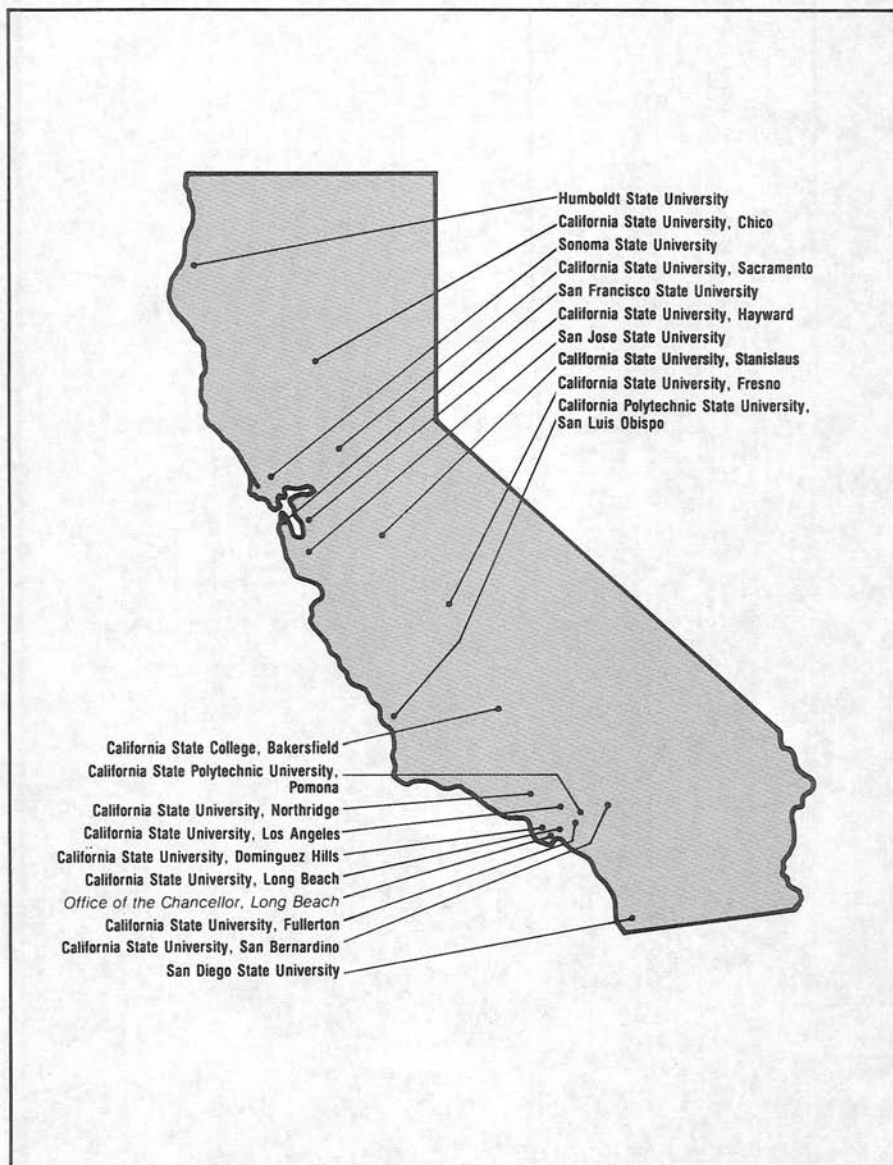
The California State University  
400 Golden Shore  
Long Beach, California 90802-4275  
(213) 590-5506

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## CAMPUSES—THE CALIFORNIA STATE UNIVERSITY

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San Luis Obispo, California 93407 ..... (805) 546-0111  
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801 West Monte Vista Avenue, Turlock, California 95380 ..... (209) 667-3122

# THE CALIFORNIA STATE UNIVERSITY







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# Introducing Cal Poly

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The Program..... 17

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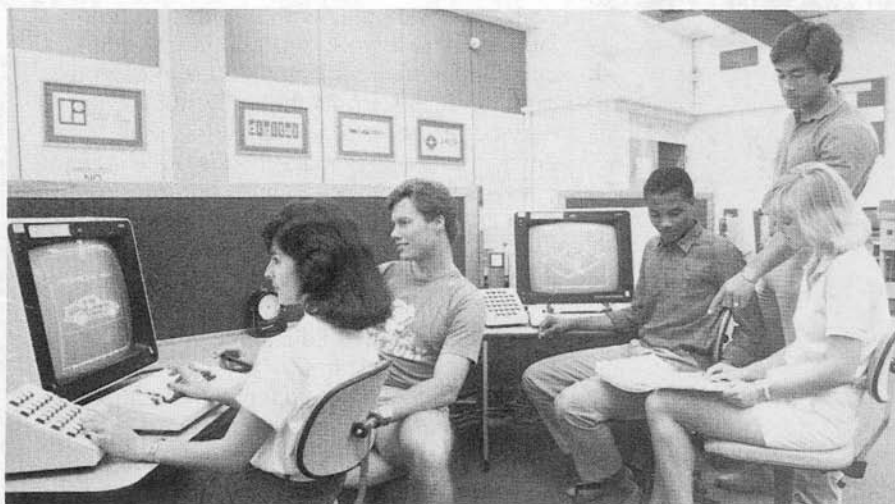


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# THE PROGRAM

CAL POLY IS DIFFERENT

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**W**alk around the Cal Poly campus and look into the corners.

Look into the classrooms, labs, studios and barns.

You find Cal Poly students reading, studying, attending class, of course.

But that's not all. You find them working — rolling up their sleeves and getting their hands dirty.

You find them testing the strength of beams, raising livestock, publishing a newspaper, designing structures, caring for young children, writing computer programs, performing music. You find them machining metal, testing aircraft, auditing books, developing experiments, building all manner of things. In a word, you find them getting *experience* as part of their education.



From row crops to computers, Cal Poly believes the best way for someone to learn something is to *do* it. That's been the school's philosophy since it began.

"Learn by doing," the university calls it.

Cal Poly students gain invaluable first-hand experience both on campus and off. Course work emphasizes it, with a high proportion of lab work, field work and special projects culminating in a senior project. On-campus opportunities such as the daily student-run newspaper and real-world agricultural enterprise projects make hands-on learning a daily reality, not just a catch phrase. Off-campus work with government agencies and major national corporations—for both academic credit and a salary—is available through various programs that include the largest Cooperative Education program in the Western United States. Many student activities are designed to give students an additional chance to apply what's learned in the classroom.

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AN  
EMPHASIS  
ON THE  
UNDERGRADUATE

Cal Poly is one of 19 campuses in The California State University, the nation's largest four-year university system. Each campus in the CSU system is given considerable freedom in developing its programs, and each has its own special qualities and strengths.

Cal Poly's emphasis is on undergraduate study. And Cal Poly's specialty is preparing undergraduates—and preparing them exceptionally well—for careers in applied technical and professional fields.

Unlike most universities, Cal Poly requires every prospective student to apply for a particular major field of study, whether seeking to enter from high school or as a transfer student from a community college or another university. Instruction in the major begins on the first day of class.

The difference shows also in the programs. Of the 56 undergraduate majors offered, 11 are available within the CSU system only at Cal Poly, and another 11 are offered at only one other CSU campus. The university's career orientation is evident in its programs in agriculture, architecture, business, design, education, engineering, graphic communication, home economics and journalism. Those and other professional programs are offered in addition to curricula in the arts, sciences, mathematics and humanities.

And those programs are state-of-the-art education. Twenty-five are accredited or recognized at the national level by independent reviewing bodies. That's one of the highest levels of accreditation in the CSU.

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## A COMPLETE EDUCATION

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Yet even as it believes in the importance of a practical education, Cal Poly firmly believes that such useful, realistic knowledge must be put into the hands of men and women who possess the maturity, awareness and wisdom to use it well.

Career education at Cal Poly is taught within the framework of a thorough general education that helps students develop fully as educated individuals, not just as trained professionals. Curricula are designed to teach students to think logically, judge critically and communicate clearly. They help give students a sense of responsibility to society—both national and international—and an understanding of their own and other cultures. Just as students in scientific and technical fields learn about the humanities, humanities majors study science and technology.



Overseas study, which can immeasurably broaden a student's knowledge and outlook, is available through year-long CSU programs, Cal Poly's spring-quarter London Study Program, and a variety of special study programs organized by Cal Poly departments and professors. The university also continues to expand its international involvement through programs involving faculty and staff as well as students.

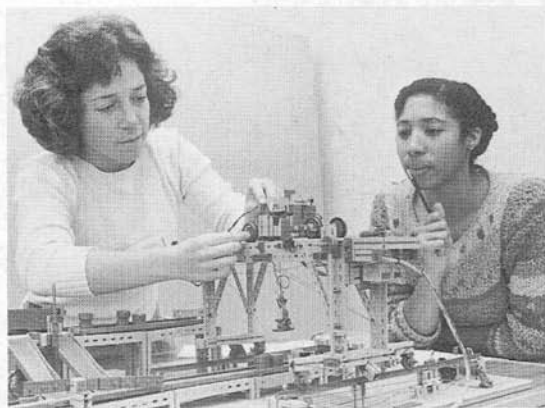
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AN  
EFFECTIVE  
EDUCATION

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In all aspects of education, Cal Poly is committed to excellence. But to measure the quality of its programs, the university doesn't rely on its reputation, national ranking, facilities, applicant test scores or other secondary measures. It looks to the yardstick of educational *effectiveness*—how good it is at helping students learn, at instilling an appreciation for learning, at developing all of a student's talents, at assessing and improving its teaching. By that measure, as by the others, Cal Poly stands tall.

An essential element in helping people learn is getting them involved in what they're learning. From the hands-on orientation of academic courses to the student responsibility built into student activities, Cal Poly evinces a true commitment to student involvement.





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A  
FACULTY  
OF TEACHERS

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A university's teachers, of course, are the ones who put the institution's educational principles into practice. Cal Poly's faculty is especially well-chosen to deliver an effective practical education. It's a teaching faculty. Professors give students top priority and individual attention. And Cal Poly faculty members have proved their competence, and continue to develop it, in the world *outside* academia as well—in research, in development, in industry, in the marketplace.

When it selects its faculty, Cal Poly doesn't look at academic qualifications alone. It seeks men and women who are interested in teaching undergraduates, who have records of successful teaching, who are committed to making their teaching even more effective, and whose professional experience shows they have met and mastered the working world their students will face.



**W**ith its approach to education and success in applying it, Cal Poly has built a solid statewide and national reputation. The proof of success is the eagerness of recruiters from business and industry to hire Cal Poly graduates, the support well-known corporations have given its programs, and the loyalty of its alumni. The quality of the university's programs attracts students from throughout California and has helped make Cal Poly one of the most popular campuses in the state.



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## THE PLACE

*A FRIENDLY, SMALL-CAMPUS FEELING*

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Cal Poly is at San Luis Obispo, a pleasant, progressive city of 38,000 on California's Central Coast, midway between San Francisco and Los Angeles. The city and university share a neighborly, small-campus, small-town feeling and one of the finest natural environments anywhere. Sparkling-clear air and a climate that's temperate year-round blend with majestic peaks, quiet valleys and the nearby ocean to create an exhilarating environment that's ideal for learning and growing.

It's a pleasure to walk around Cal Poly's compact, 375-acre central campus, with its sweeping views of the nearby peaks and valleys. To the north of the academic core is an additional 5,525 acres of rolling campus devoted to student farming, experimental architecture and other outdoor laboratory study, making Cal Poly's one of the largest campuses in the nation.

Instructional facilities are as diverse, specialized and lab-oriented as the instructional programs, and Cal Poly never stops developing new facilities and adapting old ones to include the latest technology in those continually evolving curricula. A prime example is the multimillion-dollar Computer-Aided Productivity Center, funded and equipped in large part by generous donations from industry. It's one of numerous computing facilities available daily to students at all levels in all programs. Two other examples are a new Engineering Building completed in 1985—one of the most up-to-date engineering facilities in the CSU—and a new agricultural science building scheduled to be completed by the fall of 1987.

The university's spacious, modern library contains about 660,000 books and other bound volumes and 82,000 periodicals, as well as a highly rated government documents collection and other special collections.

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*FOR  
THE NECESSITIES,  
A CHOICE*

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Students live both off campus and on. Cal Poly's residence halls—more of them than on any other CSU campus—are popular and always full. They offer a variety of living arrangements for about 2,800 students. Off-campus housing is varied also, including fraternities, sororities and large student-apartment complexes as well as private homes.

Food is available on campus to suit almost any taste and any budget—at two cafeterias, a snack bar, a burger bar, a sandwich shop, an ice cream parlor, and a full-service restaurant with a splendid view.



A modern Health Center assures attention to students' medical problems and conducts a variety of preventive programs.

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## A WORLD OF ACTIVITIES

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Possibilities for recreation and other activities are limitless. Cal Poly students join in music, dance, drama, films, fine arts, rodeo, outings, student government and many other opportunities to develop skills and interests. More than 10,000 of Cal Poly's 16,000 students are involved in 300-plus student organizations. And on Pacific beaches, along coastal dunes and ridges, in forests and at nearby lakes, students can enjoy almost any type of recreation, or just relax in an unspoiled natural setting.

Headquarters for on-campus activity is the award-winning University Union. And if you take a close look inside the Union, you might be surprised to find that, to a great extent, students are in charge. At Cal Poly, students bear much of the responsibility for planning and managing activities.

Student-run activities have earned enviable reputations even outside of California. A good example is Poly Royal, a kaleidoscopic, two-day celebration of student initiative and accomplishment; the April festivities draw more than 100,000 visitors. Another is the animated Rose Parade float designed and built jointly by students from Cal Poly and Cal Poly Pomona. Cal Poly floats consistently have won some of the most-coveted prizes in that New Year's Day event.

As for athletics, Cal Poly men compete in nine intercollegiate sports; women compete in eight. In the campus intramurals program, more than 850 teams participate in 23 sports open to both men and women. Extensive athletic and other recreation facilities are available until late at night.

Cal Poly has long been known as a friendly campus that welcomes visitors. Parking permits and campus maps are available from the information desk in the Administration Building lobby. That's also the starting point for guided campus tours, offered several times a week. For tour days and times, call (805) 546-0111 or 546-2792, or write to the Relations with Schools office. Special group tours can be arranged.

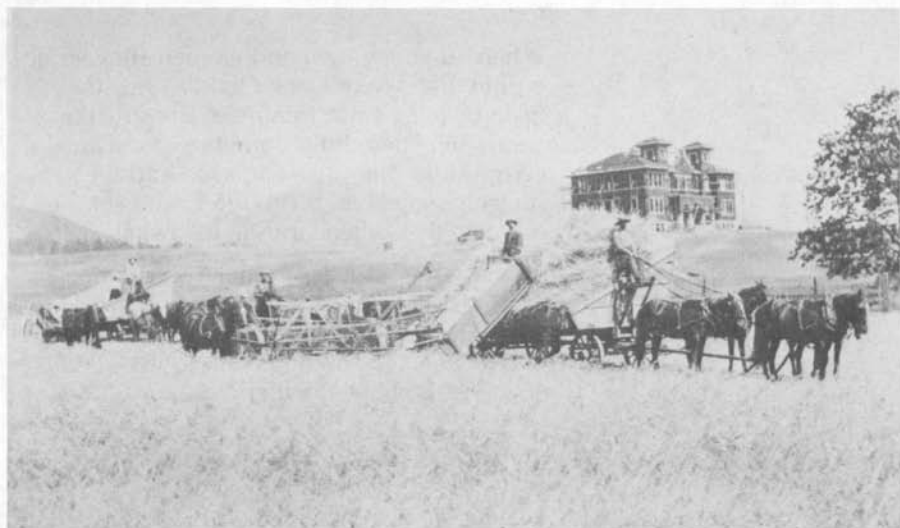


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## THE HISTORY

*A VISION THAT NEVER WAVERED*

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**I**n 1901 San Luis Obispo was a farm and rail town of just over 3,000 people. What's now the Cal Poly campus was a pasture some distance north of town. The Southern Pacific was putting its just-completed coast line into operation. And it was on March 8 of that first year of the 20th century that legislation founding the California Polytechnic School was signed into law after six years of debate.

The mandate was clear: "To furnish to young people of both sexes mental and manual training in the arts and sciences, including agriculture, mechanics, engineering, business methods, domestic economy, and such other branches as will fit the students for non-professional walks of life."

Much has changed in the ensuing years—including the definition of “professional”—as Cal Poly has grown from a vocational high school into a major university. But the essence of that original charge is still part of state law, and Cal Poly has never lost sight of the purpose for which it was created.

Cal Poly’s style was clear from the beginning, too.

When 15 young men and women showed up on the first day of class, Oct. 1, 1903, the main building wasn’t finished. Construction debris still littered the dormitory. But Director Leroy Anderson, Mrs. Anderson and the students moved in, set to work, and set the example that others are still following.

As the school’s director until 1908, Anderson emphasized learning by doing and earning while learning and established once and for all Cal Poly’s hands-on approach to its polytechnic subject matter.

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*FROM  
A SCHOOL  
TO A COLLEGE*

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During its first three decades, Cal Poly evolved into the equivalent of a junior college, and governance was transferred from a local board of trustees to the state Board of Education. Then the Depression hit, and hit hard. The Legislature considered abolishing the institution.

But in 1933 Cal Poly got a new start. Julian A. McPhee, chief of the California Bureau of Agricultural Education, agreed to become the school’s president. McPhee assumed leadership of what had been reorganized as a two-year technical college offering instruction in agriculture and industrial fields. Enrollment had been limited to men as of 1929.

During the next 33 years, until his retirement in 1966, McPhee guided Cal Poly’s transformation. A third year of instruction was added in 1936, a fourth in 1940. Cal Poly’s first baccalaureate exercises were held May 28, 1942.





During World War II, the campus was the site of a Naval Flight Preparatory School. After the war, a wave of practical-minded veterans using the G.I. Bill helped inject fresh vigor into the college's programs. The curriculum, facilities and enrollment expanded rapidly.

Cal Poly's name caught up with reality in 1947, as California State Polytechnic School became California State Polytechnic College. In those postwar years the first graduate-level programs were added to the curriculum, and in 1956, coeds returned to the campus.

**I**t was in 1961 that the college became part of the newly formed California State Colleges system (now The California State University). The last years of McPhee's presidency also witnessed new initiatives in several areas, such as in the fledgling field of computing, and an acceleration of international programs. Steadily rising enrollments reached 7,740 in 1966, McPhee's last year at the helm.

It was also in 1966 that Cal Poly's campus at Pomona, founded in 1938 as a branch of the San Luis Obispo school, was made a separate state college by the Legislature.

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*NEW  
TIMES,  
NEW CHALLENGES*

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**R**apid development continued under the 12-year presidency of McPhee's successor, Robert E. Kennedy. The college's popularity and reputation grew as it built solid programs on the solid philosophy of its founders. In 1970 Cal Poly's current organization into seven academic schools was accomplished. Then the Legislature recognized what the institution had become: In 1972 California State Polytechnic College was renamed California Polytechnic State University.

When Cal Poly's current president, Warren J. Baker, succeeded Kennedy in 1979, the student body had reached its peak of about 16,000 students. The challenges facing the university had become the challenges of broadening and refining programs and facilities to meet the need for an ever-more-sophisticated education in today's rapidly changing and interdependent world. They're the kinds of challenges Cal Poly has always anticipated and met.

**A**s Cal Poly nears the end of the 1980s, it remains clear in its purpose and proud of its achievements, but never satisfied that it can't be better. It remains a continually evolving institution, but also true to its original vision. And as Cal Poly rises among the ranks of major American universities, time continues to test and prove the worth of a Cal Poly education.







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## ACADEMIC PROGRAMS

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### ACCREDITATION

The university is fully approved as a four-year degree-granting institution by the Western Association of Schools and Colleges.

The School of Architecture and Environmental Design has four accredited programs: Architectural Engineering by the Accrediting Board for Engineering and Technology; Architecture (bachelor's and master's degrees) by the National Architectural Accrediting Board; Construction Management by the American Council for Construction Education; and Landscape Architecture by the American Society of Landscape Architects. In addition, City and Regional Planning is recognized by the American Planning Association.

The School of Engineering has 13 accredited programs: Aeronautical Engineering, Civil Engineering, Electrical Engineering, Electronic Engineering, Environmental Engineering, Industrial Engineering, Mechanical Engineering, and Metallurgical Engineering are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. Air Conditioning and Refrigeration Technology, Electronic Technology, Manufacturing Processes Technology, Mechanical Technology, and Welding Technology are accredited by the Technology Accreditation Commission of the Accreditation Board for Engineering and Technology.

Other accredited programs are Agricultural Engineering accredited by the Accrediting Board for Engineering and Technology, the Dietetics and Food Administration program approved by the American Dietetics Association, Business Administration (bachelor's degree) by the American Assembly of Collegiate Schools of Business, Chemistry by the American Chemical Society, and Home Economics by the Council for Professional Development of the American Home Economics Association. Industrial Technology is accredited by the National Association of Industrial Technology and Recreation Administration is accredited by the National Recreation and Parks Association/American Association of Leisure and Recreation.

In addition the Commission for Teacher Credentialing has authorized the university to recommend for a number of teaching credentials, described in the catalog section on "Teacher Preparation Programs."

## ACADEMIC PROGRAMS

<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
<b>School of Agriculture</b>		
	Agriculture	M.S.
	<i>Specializations:</i>	
	General Agriculture	
	International Agriculture	
	Mechanized Agriculture	
	Soil Science	
Agricultural Education Department	Agricultural Science	B.S.
	<i>Concentrations:</i>	
	Agricultural Mechanics	
	Agricultural Products and Processing	
	Agricultural Resources Management	
	Agricultural Supplies and Services	
	Animal Production	
	Ornamental Horticulture	
	Plant Production	
Agricultural Engineering Department	Agricultural Engineering	B.S.
	Mechanized Agriculture	B.S.
Agricultural Management Department	Agricultural Management	B.S.
	<i>Minor:</i> Agricultural Management	
Animal Sciences and Industry Department	Animal Science	B.S.
	Poultry Industry	B.S.
Crop Science Department	Crop Science	B.S.
	Fruit Science	B.S.
Dairy Science Department	Dairy Science	B.S.
	<i>Options:</i>	
	Husbandry	
	Dairy Products Technology	
Food Science and Nutrition Department	Food Science	B.S.
	Dietetics and Food Administration	B.S.
Natural Resources Management Department	Natural Resources Management	B.S.
	<i>Options:</i>	
	Forest Resources—Management	
	Forest Resources—Urban Forestry	
	Forest Resources—Watershed, Chaparral, and Fire Management	
	<i>Concentrations:</i>	
	Environmental Management	
	Parks and Forest Recreation	

<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
Ornamental Horticulture Department	Ornamental Horticulture <i>Concentrations:</i> Floriculture and Nursery Production Horticulture Sales and Services Landscape Industry	B.S.
Soil Science Department	Soil Science	B.S.

## **School of Architecture and Environmental Design**

Architectural Engineering Department	Architectural Engineering	B.S.
Architecture Department	Architecture	B.Arch., M.Arch.
City and Regional Planning Department	City and Regional Planning	B.S., M.C.R.P.
Construction Management Department	Construction Management	B.S.
Landscape Architecture Department	Landscape Architecture	B.S.

## **School of Business**

	Business Administration <i>Specialization:</i> Agribusiness	M.B.A.
Accounting Department	Business Administration Accounting	B.S.
Business Administration Department	Business Administration <i>Concentrations:</i> Financial Management Marketing Management	B.S.
Economics Department	Economics <i>Concentrations:</i> Business and Industrial Economics International Trade and Development Quantitative Economics	B.S.
Management Department	Business Administration <i>Concentrations:</i> Human Resources Management International Business Management Management Management Information Systems Production and Operations Management	B.S.



<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
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## School of Engineering

	Engineering	M.Engr.
	<i>Primary fields of study:</i>	
	Aeronautical Engineering	
	Biochemical Engineering	
	Civil and Environmental Engineering	
	Computer Engineering	
	Electrical Engineering	
	Electronic Engineering	
	Industrial Engineering	
	Mechanical Engineering	
	Metallurgical Engineering	
	Engineering Science	B.S.
Aeronautical Engineering Department	Aeronautical Engineering	B.S.
Civil and Environmental Engineering Department	Civil Engineering	B.S.
	Environmental Engineering	B.S.
Computer Science Department	Computer Science	B.S., M.S.
Electronic and Electrical Engineering Department	Electrical Engineering	B.S.
	Electronic Engineering	B.S.
Engineering Technology Department	Engineering Technology	B.S.
	<i>Options:</i>	
	Air Conditioning-Refrigeration Technology	
	Electronic Technology	
	Manufacturing Processes Technology	
	Mechanical Technology	
	Welding Technology	
Industrial Engineering Department	Industrial Engineering	B.S.
Mechanical Engineering Department	Mechanical Engineering	B.S.
	<i>Concentrations:</i>	
	General Heating, Ventilating, Air Conditioning, and Solar Petroleum	
Metallurgical Engineering Department	Metallurgical Engineering	B.S.

## School of Liberal Arts

Art and Design Department	Applied Art and Design	B.S.
	<i>Options:</i>	
	Graphic Design	
	Photography	
English Department	English	B.A., M.A.
	<i>Minors:</i>	
	English	
	Linguistics	

## 38 Academic Programs

<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
Foreign Languages Department	<i>Minors:</i> French German Spanish	
History Department	History	B.A.
Journalism Department	Journalism <i>Concentrations:</i> Agricultural Journalism Broadcast Journalism News-Editorial Public Relations	B.S.
Music Department	<i>Minor:</i> Music	
Philosophy Department	<i>Minor:</i> Philosophy	
Political Science Department	Political Science <i>Concentrations:</i> International Affairs Pre-Law Public Administration Teaching Urban Studies <i>Minor:</i> Public Administration	B.A.
Social Sciences Department	Social Sciences <i>Concentrations:</i> Criminal Justice Cross-Cultural Studies Organizations Social Sciences (Teaching) Social Services	B.S.
Speech Communication Department	Speech Communication <i>Minor:</i> Speech Communication	B.A.
Theatre and Dance Department	<i>Minors:</i> Dance Theatre	

## School of Professional Studies and Education

	Liberal Studies <i>Minor:</i> Gerontology	B.A.
Education Department	Counseling Education <i>Specializations:</i> Administrative Services Computer Based Education Counseling and Guidance Curriculum and Instruction Reading Special Education Special Interest Option	M.S. M.A.

<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
Graphic Communication Department	Graphic Communication <i>Options:</i> Computer Graphic Communication Design Reproduction Technology Printing Management Printing Technology	B.S.
Home Economics Department	Home Economics	B.S., M.S.
Industrial Technology Department	Industrial and Technical Studies Industrial Technology <i>Options:</i> Industrial Education Industrial Management Vocational Education	M.A. B.S.  B.V.Ed.
Military Science Department		
Physical Education and Recreation Administration Department	Physical Education <i>Options:</i> Commercial/Corporate Fitness Health Education Teaching Physical Education Recreation Administration <i>Concentrations:</i> Private/Commercial Recreation Therapeutic Recreation	B.S.    M.S. B.S.
Psychology and Human Development Department	Child and Family Development <i>Options:</i> Applied Developmental Psychology Early Childhood Education Family Studies <i>Minor:</i> Psychology	B.S.

## School of Science and Mathematics

Biological Sciences Department	Biological Sciences <i>Concentrations:</i> Anatomy-Physiology Biology Marine Biology Plant Pathology-Entomology Plant Tissue Culture Technology Biological Sciences Environmental and Systematic Biology <i>Concentrations:</i> Ecology Fisheries and Wildlife Systematics Microbiology <i>Options:</i> General Microbiology Medical Laboratory Technology	B.S.      M.S. B.S.   B.S.
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## 40 Academic Programs

<i>Schools and Departments</i>	<i>Curricula with Options/Concentrations/Minors</i>	<i>Degrees</i>
Chemistry Department	Biochemistry Chemistry	B.S. B.S., M.S.
Mathematics Department	Mathematics <i>Options:</i> Applied Mathematics Finite Mathematics Mathematics Teaching Mathematics <i>Specializations:</i> Applied Mathematics Mathematics Teaching	B.S.      M.S.
Physics Department	Physical Science Physics	B.S. B.S.
Statistics Department	Statistics	B.S.



**Enrollment in Undergraduate and Graduate Programs, and  
Enrollment of Men and Women Students, by School and  
Major, FALL 1985**

Schools and Major Curricula	Under- grad- uate Pro- grams	Grad- uate Pro- grams	Men	Women	Total Enroll- ment
<i>School of Agriculture</i>					
Agriculture (M.S.)	—	87	57	30	87
Agricultural Education/Science	139	—	55	84	139
Agricultural Engineering	199	—	177	22	199
Agricultural Management	857	—	549	308	857
Animal Science	586	—	200	386	586
Crop Science	203	—	183	20	203
Dairy Science	119	—	77	42	119
Dietetics and Food Administration	271	—	16	255	271
Food Science	120	—	56	64	120
Fruit Science	57	—	47	10	57
Mechanized Agriculture	106	—	105	1	106
Natural Resources Management	268	—	181	87	268
Ornamental Horticulture	397	—	226	171	397
Poultry Industry	35	—	28	7	35
Soil Science	44	—	35	9	44
Totals	3,401	87	1,992	1,496	3,488
<i>School of Architecture and Environmen- tal Design</i>					
Architectural Engineering	213	—	165	48	213
Architecture	796	30	614	212	826
City and Regional Planning	129	17	96	50	146
Construction Management	193	—	181	12	193
Landscape Architecture	187	—	121	66	187
Totals	1,518	47	1,177	388	1,565
<i>School of Business</i>					
Business Administration	1,367	100	695	772	1,467
Economics	156	—	101	55	156
Totals	1,523	100	796	827	1,623
<i>School of Communicative Arts and Humanities</i>					
Applied Art and Design	223	—	91	132	223
English	235	25	77	183	260
History	170	—	96	74	170
Journalism	262	—	84	178	262
Political Science	221	—	129	92	221
Social Sciences	299	—	121	178	299
Speech Communication	140	—	50	90	140
Totals	1,550	25	648	927	1,575

### Enrollment in Undergraduate and Graduate Programs, and Enrollment of Men and Women Students, by School and Major, FALL 1985 (Continued)

Schools and Major Curricula	Under- grad- uate Pro- grams	Grad- uate Pro- grams	Men	Women	Total Enroll- ment
<i>School of Engineering</i>					
Aeronautical Engineering	301	—	251	50	301
Civil Engineering	372	—	311	61	372
Computer Science	427	72	322	177	499
Electrical Engineering	250	—	205	45	250
Electronic Engineering	720	—	626	94	720
Engineering (M. Engr.)	—	39	36	3	39
Engineering Science	26	—	16	10	26
Engineering Technology	422	—	398	24	422
Environmental Engineering	67	—	51	16	67
Industrial Engineering	204	—	123	81	204
Mechanical Engineering	720	—	621	99	720
Metallurgical Engineering	83	—	76	7	83
Totals	3,592	111	3,036	667	3,703
<i>School of Professional Studies and Education</i>					
Child Development	433	—	26	407	433
Counseling	—	42	10	32	42
Education	—	318	95	223	318
Graphic Communication	313	—	147	166	313
Home Economics	342	3	3	342	345
Industrial Arts	20	12	30	2	32
Industrial Technology	284	—	225	59	284
Liberal Studies	425	—	35	390	425
Physical Education	345	29	151	223	374
Recreation Administration	212	—	61	151	212
Vocational Education	0	—	0	—	0
Totals	2,374	404	783	1,995	2,778
<i>School of Science and Mathematics</i>					
Biochemistry	169	—	83	86	169
Biological Sciences	502	19	221	300	521
Chemistry	90	9	62	37	99
Environmental and Systematic Biology	72	—	29	43	72
Mathematics	291	11	167	135	302
Microbiology	90	—	26	64	90
Physical Science	21	—	12	9	21
Physics	96	—	85	11	96
Statistics	38	—	28	10	38
Totals	1,369	39	713	695	1,408
Campus Totals	15,327	813	9,145	6,995	16,140







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## **SPECIAL PROGRAMS AND RESOURCES**

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### **ALUMNI ASSOCIATION**

Cal Poly's Alumni Association is the most important organization linking the university and the close to 150,000 students who have attended Cal Poly. To keep in touch with former students, the Alumni Association coordinates a variety of alumni functions both educational and social, on and off campus, throughout California and across the nation.

The Alumni Association is governed by a president, two regional vice presidents, a secretary-treasurer, and a board of directors representing all areas of California and various parts of the United States. The Office of Alumni Relations, which coordinates the activities of the association, is located on campus in Alumni House. The association has active alumni chapters in Alaska, Arizona, the District of Columbia, Hawaii, Texas and Washington. Those chapters offer social and educational events for Cal Poly alumni in their areas, and create a rallying point for alumni activities.

More than 15,000 active members of the Alumni Association enjoy opportunities to participate in group travel, insurance plans and many other unique alumni-sponsored programs such as Homecoming and special events during Poly Royal.

The Cal Poly Alumni Association has a keen interest in student activities, hosting special events for students and sponsoring special student groups, such as a Student Alumni Council known as Poly Reps.

### **COMPUTING AT CAL POLY**

High enrollments in technical disciplines such as architecture, computer science and engineering have helped to establish Cal Poly's solid reputation as a leading technological learning center within the CSU. These disciplines are supported by a comprehensive and rapidly-expanding computing environment. Cross-discipline computer literacy is encouraged and supported at all levels.

Computer services at Cal Poly are provided by the Information Systems organization, which includes the central computing facility, a Computer-Aided Productivity Center, and Microcomputers and Telecommunications Support. The Computer Services department provides system and operational support to centrally-funded computing resources, and the Instructional Support Group (ISG) and Administrative Support Group (ASG) advise and support these respective groups of computers users.

### **Facilities**

Students in all majors may use the university's instructional terminals to interactively access centrally supported computer systems which include a PRIME 9750 and PYRAMID UNIX "super-mini" computers dedicated to instructional use, and a CYBER 170/730 which provides computing services to the administrative as well as instructional community. Students and faculty also have access to the CYBER 730/760 located at the State University Data Center in Los Angeles. A growing number of instructional microcomputer labs throughout the campus provide training on these increasingly popular computing tools. Acquisition of both mini- and micro-computers by individual schools increases instructional access to computing in specific high-demand disciplines.

### **Instructional Computing Support**

Consulting is provided by programming assistants in the campus' main lab and by the instructional support group. The instructional support group also provides informative handouts and workshops on a wide array of computing topics.

## Administrative Computing

Many administrative offices use the center's computing facilities to meet their needs. Administrative systems include student registration, admissions and grades, as well as many business office systems.

## Computer-Aided Productivity Center

The Computer-Aided Productivity Center has been established to provide campus, state and national leadership in Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) education and research. As the California State University's designated Specialty Center for CAD/CAM, the campus shares its educational resources and expertise with other campuses statewide.

The Computer-Aided Productivity Center is currently responsible for implementing over \$5,000,000 in industry grants. This includes a 21-station IBM grant system which is expected to expand to well over 200 networked microcomputer CAD/CAM workstations by 1987. Donations of a Data General MV/10000-based CAD system and a DEC PDP 11/44-based CAM system have also been fostered by the Center.

The Computer-Aided Productivity Center is one of the most active CAD/CAM organizations in any university in the nation. In its first 30 months of operation, the Center provided the opportunity for substantial state-of-the-art CAD/CAM experience to over 80 faculty and 2000 students.

In addition to education for improved design techniques, the Computer-Aided Productivity Center is actively capitalizing on major university strengths in CAM. The Center has connected the design data base directly to Cal Poly's computer-controlled machine tools. The result is an ability to educate students in the completely paperless design and manufacturing methodologies of tomorrow.

## THE CONSORTIUM OF THE CALIFORNIA STATE UNIVERSITY

The Consortium of the CSU—"The 1000-Mile Campus"—is a separate, fully accredited, degree-granting institution of the CSU. It draws on the combined resources of the 19 campuses to offer external statewide and regional degree, certificate, and credential programs.

The Consortium was established in 1973 to meet the needs of adults who find it difficult or impossible to participate in regular on-campus programs. Instruction is thus provided students in convenient places at convenient times. Currently, programs are offered in more than 50 sites throughout California.

Full- and part-time CSU faculty, as well as qualified experienced practitioners, go where the students are, or provide opportunities for individualized home study. Programs can be tailored to meet the specific needs of employees in business, industry, education, or government.

Consortium programs are upper division or graduate level. All courses offer residence credit leading to bachelor's or master's degrees. Credit and course work are transferable statewide. Programs are financed by student fees.

Academic policy for The Consortium is recommended by the Consortium Advisory Committee, a committee of the Academic Senate of the CSU. Degrees or certificates are awarded by The Consortium in the name of the Board of Trustees of the CSU. The Consortium is accredited by the Western Association of Schools and Colleges.

For more information contact: The Consortium of The California State University, 400 Golden Shore, Long Beach, California 90802-4275; (213) 590-5696.

The statewide Admissions and Records Office may be reached by dialing the following local numbers: Los Angeles and Long Beach areas (213) 498-4119; all other areas in California toll free (800) 352-7517.

## COOPERATIVE EDUCATION PROGRAM

Cal Poly's Cooperative Education Program is one of the largest programs of its kind in the Western United States. The program is designed to meet unique educational needs of students by providing practical work experience directly related to academic fields of study and career objectives through

alternating periods of on-the-job training in business, industry, and government with periods of classroom study.

Students participating in the Cooperative Education Program at Cal Poly are given the opportunity to work with professionals in their fields of study and to explore career choices from the vantage point of the work place. The experience gained through participation in a Cooperative Education assignment is especially beneficial to students who wish to expand their employment opportunities upon graduation. Including Cooperative Education as part of their academic program offers students the opportunity to enhance their on-campus study with alternating periods of supervised full-time, off-campus paid employment. Students who participate in this program gain marketable knowledge, earn academic credit, receive competitive wages, and develop maturity and self confidence.

While the learning experience is the primary objective of Cooperative Education, it is also a method through which students can finance a portion of their education. Cooperative Education students find that the income from their training assignments can significantly reduce portions of their university-related expenses. In addition, Co-op students are often hired at a higher level than graduates who are making their initial entry into the job market without the advantage of the Cooperative Education experience.

Students with a GPA of 2.0 or higher and who have completed their freshman year (or one quarter in residence for transfer students) are eligible to register with the Cooperative Education Office and begin the Co-op job search process. The Cooperative Education Office provides assignment opportunities for students with employers located primarily in California and the Western United States. However, placement is not limited to this region. Students also are placed in other parts of the United States and abroad. The Cooperative Education Office is continually seeking new business, industry, and government contacts in order to provide appropriate employment for interested students.

During their three to six months of work experience, students receive on-the-job evaluations by their immediate supervisors and by university Co-op coordinators. They are also required to write a term paper, do a task analysis, keep a log, and meet with their Cooperative Education coordinator for a debriefing interview upon their return to campus.

Cal Poly's goal is to enable all students who desire to do so to benefit from this unique educational program. Additional information regarding the program may be obtained from the Cooperative Education Office located in Chase Hall or from the Cooperative Education department coordinator within each academic department.

## **EXTENDED EDUCATION**

The university's extended education programs provide a variety of services to residents of San Luis Obispo, Santa Barbara, and southern Monterey Counties. Extended education programs are self-supporting through student enrollment fees or agency funding. An annual catalog describing the programs and courses is available free from the Extended Education Office. Each quarter, a supplementary course schedule is also available, listing the location, date, and time for each course.

### **Extension Programs**

The extension program provides a way to earn college credit, acquire skills, enhance career opportunities, or broaden awareness of today's world without applying for formal admission to the university. Extension courses are offered at various locations throughout the tri-counties. Enrollment does not imply formal admission to the university. The maximum extension credit which may be accepted toward the bachelor's degree is 36 quarter units. No more than 13 quarter units may be counted toward the master's degree.

Many extension courses are short seminars or workshops that do not provide college credit, but that offer opportunity for professional development or personal development for working people and members of the central coast community of all ages. Some of these seminars and workshops are parts of larger programs that lead to a certificate of completion. The programs are also described in the annual Extended Education catalog.

Extension students may also take regular on-campus courses on a space- available basis through the concurrent enrollment program. *Extension fees and unit limitations apply to concurrent enrollment students.* Petitions and application forms may be obtained from the Extended Education Office.

## Special Sessions and External Degree Programs

Special sessions are programs or courses which earn residence credit outside of the regular campus program. Special sessions are self-supporting through fees collected from the participating students. Requests for application forms and information may be obtained from the Extended Education Office.

Summer sessions courses and workshops leading to various degrees and credentials are designed to meet the needs of regular or visiting students and others who wish to improve their professional competence during the summer. Admission does not require completion of the matriculation process. Registration will not insure the privilege of enrollment in one of the regular quarters.

External degree programs in several fields are being developed for working professionals at off-campus locations in the tri-county service area of Cal Poly. Information on these programs as they develop can be obtained from the Extended Education Office.

## Conferences on Campus

Cal Poly provides facilities, faculty and staff assistance as needed for conferences, professional meetings, and other special programs related to its educational objectives. Assistance to arrange classroom or auditorium space, housing, food services, financial services, and other aspects of such programs is provided through the Conference Services Office connected with the Housing and Conference Services Department. Extended Education provides support for the educational aspects of conferences and special programs, such as arrangements for academic or professional credit, recruiting and compensation of seminar leaders and instructors, and publicity through extension media. Short courses are administered by and applications may be obtained from the Extended Education Office. Programs are scheduled throughout the year with the major concentration during the summer.

## THE FOUNDATION

The California Polytechnic State University Foundation is a separate nonprofit corporation created to support and assist the educational mission of the university. The major objectives of the Foundation are:

- To provide the fiscal means and management procedures that enable the university to carry on activities providing those instructional and service aids not normally furnished by the state.
- To provide effective operation of key support services which would not otherwise be available due to legal, purchasing, and other fiscal restrictions.
- To provide fiscal procedures and management systems that foster effective coordination of the auxiliary activities with the university in accordance with sound business practices.

Important services provided to the university community include El Corral Bookstore, Communications/Media Productions, and campus Food Services. In addition, the Foundation provides the basic financial, management, and business support services for University Graphics System; sponsored research, grant, and workshop projects; and serves as a trustee for gifts designated for the university and its various educational programs.

The Foundation aids students financially by sponsoring student enterprise projects and by employing students. By loaning operating capital for faculty- supervised and educationally significant projects, the Foundation aids students by helping them to combine learning and earning.

A Board of Directors oversees the operation of the Foundation which is administered by a management staff. Activities in which the Foundation is engaged must be requested and approved by the university, and each year the operations are subject to independent financial and compliance audits.

The Foundation Board holds monthly meetings which are open to the public and are regularly attended by representatives of the university's faculty, staff, and the student government.

## HEALTH SCIENCES—PREPROFESSIONAL PREPARATION

### Choosing a Major

There is no "best" major to prepare you for professional school, as long as you meet the prerequisites for your chosen profession. Your major should be chosen on the basis of interest and as preparation for an alternate career. Typically at Cal Poly, students major in Biological Sciences or Biochemistry if interested in dental or medical school; major in Animal Science, Biological Sciences, Dairy Science or Poultry Industry if interested in veterinary medicine; and major in Biochemistry, Biological Sciences or Microbiology if interested in medical technology. Students interested in professional schools which do not generally require a baccalaureate degree for entrance (chiropractic, nursing, optometry, pharmacy, or physical therapy) choose a wide variety of majors on campus.

Since specific requirements vary for each professional school, students should contact the schools directly or consult with the Chairman of the Health Professions Guidance and Evaluation Committee.

### Preprofessional Advising

Students applying to professional schools in the health sciences (e.g. dental, medical, veterinary school) have need of current information in order to be competitive for admission. A Health Professions Guidance and Evaluation Committee has been established to assist students, regardless of their major, in all phases of their preparation. It helps identify the appropriate health profession, suggests the necessary preparatory courses, and develops the proper strategy for entrance. The committee lends advising materials, critiques personal statements connected with applications, interviews in order to write letters of evaluation, and helps prepare students for interviews at professional schools. If necessary, alternate careers are suggested.

The Committee consists of 14 faculty from the departments of Animal Sciences and Industry, Biological Sciences, Chemistry, Mathematics, Physical Education and Recreation Administration, and Physics and a staff member from the Counseling Center. For more information about the pre-health professions program at Cal Poly, contact the departments noted above or: Chairman of the Health Professions Guidance and Evaluation Committee, School of Science and Mathematics, Cal Poly, San Luis Obispo, CA 93407; phone (805) 546-2226.

### Chiropractic

Students only need to complete two years of preprofessional work prior to admission to chiropractic school. All accredited programs require identical course work. For more information consult the latest edition of "Chiropractic State of the Art" published by the American Chiropractic Association (1916 Wilson Blvd., Arlington, VA 22201). The following Cal Poly courses meet the minimum preparation:

CHEM 127, 128, 129, 316, 317, 318  
ENGL 114, 125, 215/218  
PHYS 121, 122, 123

PSY 201/202, 307  
ZOO 131, 237, 300  
2 courses in Social Science or Humanities

### Dentistry

Students complete three to four years of preprofessional course work prior to admission to dental school. For exact prerequisites check individual catalogs or the latest edition of "Admissions Requirements of U.S. and Canadian Dental Schools" published by the American Association of Dental Schools (1625 Massachusetts Avenue, N.W., Washington, D.C. 20036). The Dental Aptitude Test (DAT) should be taken at least one year prior to the projected date of admission. Students usually apply to 8–12 schools. The following Cal Poly courses meet the minimum preparation:

CHEM 127, 128, 129, 316, 317, 318  
ENGL 114, 125, 215/218  
PHYS 121, 122, 123

PSY 201/202, 307  
ZOO 131, 132, 133

### Medical Technology (Clinical Laboratory Technology)

Students need to complete a baccalaureate degree, which includes the specified course work in order to qualify for the required twelve-month medical technology traineeship. The microbiology major (medical technology option) offers excellent preparation for a traineeship and faculty in the

Biological Sciences Department serve as knowledgeable advisers. The following Cal Poly courses meet the minimum preparation:

BACT 224, 225, 423

PHYS 121, 122, 123

BOT 121

ZOO 131, 426, 428

CHEM 127, 128, 129, 326, 328, 331

### Medicine (Allopathic, Osteopathic, Podiatric)

Students generally complete three to four years of preprofessional course work prior to admission to medical school. For exact prerequisites, check individual catalogs or for allopathic medicine, the latest edition of the "Medical School Admissions Requirements, U.S.A. and Canada" published by the Association of American Medical Colleges (One Dupont Circle, N.W., Washington, D.C. 20036) or for osteopathic medicine, the latest edition of "The Education of the Osteopathic Physician," published by the American Association of Colleges of Osteopathic Medicine (6110 Executive Blvd., Suite 405, Rockville, MD 20852). There is no similar general publication for osteopathic and podiatric medical colleges. For allopathic and schools the Medical College Admissions Test (MCAT) must be taken at least one year prior to the projected date of admission. However, for some podiatric schools, the MCAT can be taken as late as the Spring of the year of projected admission. Students usually apply to 8–30 allopathic schools, or 3–6 osteopathic schools or 2–6 podiatric schools. The following Cal Poly courses meet the minimum preparation:

CHEM 127, 128, 129, 316, 317, 318

PHYS 121, 122, 123

ENGL 114, 125, 215/218

ZOO 131, 132, 133

MATH 141, 142

### Nursing

Two years are usually required to complete prerequisites prior to transferring to community college, hospital diploma, or baccalaureate nursing programs. Prerequisites vary greatly from program to program and students should consult individual catalogs or the latest edition of "Baccalaureate Education in Nursing: Key to a Professional Career in Nursing" published by the National League for Nursing (10 Columbus Circle, New York, N.Y. 10019). A professional exam may be required for entrance. The following Cal Poly courses meet the minimum preparation:

BACT 221

PSY 201/202

CHEM 127, 128, 326, 328

SOC 105

ENGL 114, 125

ZOO 131, 237, 300, 340

DFA 210

### Occupational Therapy

Professional Training occurs at one of three California institutions, Loma Linda University (B.S. program), San Jose State University (B.S. program) and University of Southern California (B.S. and M.S. program). Depending upon the type of program, applicants generally complete two to four years of preprofessional course work. Individual schools should be contacted for their specific requirements. Applicants are expected to be proficient in arts and crafts activities as well as to have experience in the field. The following Cal Poly courses meet the minimum preparation:

PSY 201/202

1 course in Studio Art or

SOC 105 or ANT 201

Industrial Arts skills

ZOO 131, 237, 300, 340

### Optometry

Students generally complete three to four years of preprofessional course work prior to acceptance to optometry school. The Optometry College Admissions Test (OCAT) is required for entrance. For exact prerequisites, check individual catalogs or the latest edition of "Admissions to Schools and Colleges of Optometry" published by the American Optometric Association (243 N. Lindbergh Blvd., St. Louis, MO 63141). The following Cal Poly courses meet the minimum preparation:

BACT 221

PSY 201/202

CHEM 127, 128, 129, 316, 317

STAT 211

ENGL 114, 125, 215/218

ZOO 131, 132, 133, 238, 300

MATH 141, 142

1 year of Social Science

PHYS 121, 122, 123

**Pharmacy**

Students generally complete two to three years of preprofessional course work prior to admission to pharmacy school. The Pharmacy College Admissions Test (PCAT) may be required. For exact prerequisites, check individual catalogs or the latest edition of "Pharmacy School Admission Requirements" published by the American Association of Colleges of Pharmacy (4630 Montgomery Ave., Suite 201, Bethesda, MD 20814). Students usually apply to 2 to 3 schools. The following Cal Poly courses meet the minimum preparation:

BACT 221	PHYS 121
CHEM 127, 128, 129, 316, 317, 318	PSY 201/202, 301
ECON 211, 212	SPC 201/202
ENGL 114, 125, 215/218	ZOO 131, 132, 133
MATH 120, 141, 142	

**Physical Therapy**

Currently professional training occurs at either the Certificate, Baccalaureate or Graduate level. By 1990, all professional programs in the United States will be at the graduate level only. There is no one publication that lists the general requirements for all Physical Therapy schools, therefore, applicants should consult individual catalogs. Applicants are expected to have considerable experience in the field. Graduate programs require satisfactory scores on the Graduate Record Examination (GRE). The following Cal Poly courses meet the minimum preparation:

BACT 221	PSY 201/202, 307
CHEM 127, 128, 326	SOC 105
PHYS 121, 122, 123	ZOO 131, 132, 133, 237, 300, 340

**Physician Assistant**

Physician Assistant (P.A.) programs generally require one to two years of undergraduate course work and one to two years of patient care experience. Each school has its own special requirements, thus students should consult individual catalogs or the latest edition of the "National Health Practitioner Program Profile" published by the Association of Physician Assistant Programs (2341 Jefferson Davis Highway, Suite 700, Arlington, VA 22202). The following Cal Poly courses meet the minimum preparation:

BACT 221	PSY 201/202, 307
ENGL 114	SOC 105 or ANT 201
MATH 114	ZOO 131, 237, 300, 340

**Veterinary Medicine**

Students generally complete three to four years of preprofessional course work prior to admission to veterinary school. In the past, only the veterinary school at U.C. Davis accepted applicants from California, but recently California residents have been accepted to several out-of-state veterinary schools, both public and private. For exact prerequisites and residency requirements, check individual catalogs or the latest edition of "Veterinary Medical School Admission Requirements in the United States and Canada" published by Betz Publishing Company, Inc. (P.O. Box 34631, Bethesda, MD 20817). Generally, the veterinary colleges expect applicants to have at least six months of veterinarian supervised experience preferably with both large and small animals. A professional exam is usually required for entrance. The following Cal Poly courses meet the minimum preparation:

ASCI 111/112/113/114, 202	MATH 141
BACT 221	PHYS 121, 122, 123
BIO 303	PSY 201/202
CHEM 127, 128, 129, 316, 317, 318	STAT 211
328/371	VS 438 or BIO 431 and ZOO 432 and ZOO 433
ENGL 114, 125, 215/218	ZOO 131, 132, 133, 303, 304



## INSERVICE TRAINING IN AGRICULTURE

Cal Poly plays an active role in the inservice training of high school and community college teachers of agriculture by providing instructional staff and facilities for workshops and training programs cooperatively sponsored by the university and the State of California.

The campus provides an annual summer skills program. The content varies, depending upon the needs and desires of the teachers as these are expressed through the California Agricultural Teachers Association. University faculty members provide up-to-date training in the technical phases of agriculture and also contribute to the professional improvement of teachers by offering instruction in teaching methods.

The annual summer conference of the California Agricultural Teachers Association is held at the campus with an attendance of over 500 persons. Facilities, special speakers, exhibits, and other services are provided.

## INTERNATIONAL PROGRAMS

The California State University (CSU) International Programs offers students the opportunity to continue their studies overseas for a full academic year while they remain enrolled at their home CSU campus. The International Programs' primary purposes are to enable selected students to gain a firsthand understanding of other areas of the world and to advance their knowledge and skills within specific academic disciplines in pursuit of established degree objectives.

A wide variety of academic majors may be accommodated by the 26 foreign universities cooperating with the International Programs in 16 countries around the globe. The affiliated institutions are: the University of Queensland (Australia); the University of Sao Paulo (Brazil); the universities of the Province of Quebec (Canada); the University of Copenhagen, (through Denmark's International Student Committee's Study Division); the University of Provence (France); the Universities of Hamburg, Heidelberg, and Tubingen (Germany); the Hebrew University of Jerusalem (Israel); the University of Florence (Italy); Waseda University (Japan); the Iberoamericana University (Mexico); Massey University and Lincoln University College (New Zealand); the Catholic University of Lima (Peru); National Chengchi University (Republic of China/Taiwan); the Universities of Granada and Madrid (Spain); the University of Uppsala (Sweden); and Bradford and Bristol Universities (the United Kingdom). Information on academic course offerings available at these locations is in the International Programs bulletin which may be obtained from the International Programs representative on campus.

Eligibility for application is limited to those students who will have upper division or graduate standing at a CSU campus by the time of departure, who possess a cumulative grade point average of 2.75 or 3.00, depending on the program, for all college level work completed at the time of application, and who will have completed required language or other preparatory study where applicable. Selection is competitive and is based on home campus recommendations and the applicant's academic record. Final selection is made by the Office of International Programs in consultation with a statewide faculty selection committee.

The International Programs supports all tuition and administrative costs overseas for each of its participants to the same extent that such funds would be expended to support similar costs in California. Students assume responsibility for all personal costs, such as transportation, room and board, and living expenses, as well as for home campus fees. Because they remain enrolled at their home CSU campus while studying overseas, International Programs students earn full resident credit for all academic work completed while abroad and remain eligible to receive any form of financial aid (other than work-study) for which they can individually qualify.

Information and application materials may be obtained from the International Programs Office, Dexter Building 211, or by writing to The California State University International Programs, 400 Golden Shore, Long Beach, California 90802-4275. Applications for the 1987-88 academic year overseas must be submitted by February 1, 1987.

## ROBERT E. KENNEDY LIBRARY

The Robert E. Kennedy Library provides a variety of comfortable and attractive environments for study, research, and browsing. The building features an interior courtyard design, open stack accessibility, and individual study stations. The Library collection contains over two million bibliographic items. The 700,000-volume book collection is supplemented by periodicals, art prints, nearly 1,500,000 microforms, senior projects, government documents, maps, audio visual materials, and various special collections.

One of the major activities of the Library is library instruction. Besides individual instruction in the use of the library, librarians conduct library tours for groups and individuals and also give lectures to class groups at the request of instructors. The Library offers two credit-bearing courses in the use of library materials to students during Fall, Winter, and Spring quarters.

The Reference Department contains extensive holdings of reference materials, indexes, and abstracts. Also included in the reference collections are telephone directories for all metropolitan areas and state capitals within the United States, industrial standards from the major professional and trade associations, manufacturers' catalogs from over 16,000 companies, college catalogs from all fifty states, annual reports from all corporations listed on the American and New York Exchanges, and computer manuals. In addition to regular reference service, on-line computer search services are available for student and researcher needs.

The Learning Resources and Curriculum Department provides students with the textbook collection, the curriculum materials collection, the children's book collection, the standardized text collection,



and audiovisual materials including video cassettes, audio cassettes, color slides, sound filmstrips, film loops, multi-media kits, study prints and fine art prints.

The Government Documents and Maps Department is a selective depository for United States documents and California State documents. It also contains the local government collection, Agricultural Experiment Station and Extension Service publications, National Technical Information Services (NTIS) and United Nations documents, and is the Diablo Canyon Nuclear Power Plant Document Depository.

The Special Collections and University Archives Department contains many specialized research collections which because of their value or rarity must have added protection. The Julia Morgan (Hearst Castle architect) collection, the Fairs (world, state, and local) collection, and the Arthur G. Barton (architect of Dodger Stadium) collection are a few examples of the materials the Library has obtained in recent years.

The University Archives houses records and other materials which document the history, development, and activities of the university from its beginning in 1903 to the present day.

Materials which are not available in the Library's collections can be requested from Interlibrary Loan and supplied from one of the nineteen CSU libraries, the University of California library system, or from other cooperating libraries throughout the United States.

## PROFESSIONAL DEVELOPMENT

Cal Poly seeks to instill in its students intellectual maturity, an appreciation of learning and a dynamic professionalism. To foster such attitudes among students, the university places great emphasis on faculty professional development. It strives to stimulate faculty members to challenge themselves—to develop professionally through membership in organizations, creative activities, consulting, professional experience in business and industry, and applied or basic research.

Outside sources of funding to promote faculty professional development activities are actively sought through the Research Development Office. Students often participate in research and development through classroom and laboratory exercises, in senior projects and master's theses, and by working as student assistants on sponsored projects.

## RELATIONS WITH SCHOOLS

The Relations with Schools Office provides information about the university and its academic programs to educators, counselors, prospective applicants and their parents. It serves as a central point for inquiries received about the educational programs and requirements of the university. Staff are available to visit high schools and community colleges with information and materials on the instructional offerings. Prospective students or their parents planning to visit the campus should contact this office at (805) 546-2792 for information regarding appointments or campus tours.

## SERVICES TO VOCATIONAL AGRICULTURE

Services to vocational agriculture departments in the secondary schools of California are provided by the campus staff through such activities as: visiting vocational agriculture departments to discuss with teachers and students dairy, animal husbandry, deciduous and citrus fruits, field and truck crops, poultry, farm mechanics, farm management, and other problems, including computer applications to agriculture; writing for agricultural magazines; assisting high school vocational agriculture departments to solve educational and agricultural problems through correspondence; judging of livestock, poultry, crops and other products at fairs; furnishing of breeding stock and hatching eggs to improve herds and flocks owned by Future Farmers throughout the State; and preparing a variety of teaching aids. These services are provided through a cooperative arrangement with the State of California.

Other services to vocational agriculture are rendered by the Instructional Materials Program sponsored by the university to create a variety of visual aids for educational use.

## TEACHER PREPARATION PROGRAMS

Cal Poly is authorized by the Commission for Teacher Credentialing to prepare candidates and recommend for the following credentials:

- Multiple Subject Instruction (as commonly practiced in California elementary schools)
- Single Subject Instruction (as commonly practiced in California high schools and most junior high schools)
- Administrative Services
- Pupil Personnel Services
- Reading Specialist
- Special Education (Learning Handicapped Specialist, Severely Handicapped Specialist, and Resource Specialist Certificate)
- Bilingual Emphasis for Multiple and Single Subject Instruction

Further information, requirements, and procedures for entering a particular credential program may be obtained from the Education Department Credentials Office and the appropriate credential program coordinator. A bulletin, Teaching Credential Requirements for Single Subject and Multiple Subject Instruction, is available upon request from the Education Department.

Approved university degree majors which have received examination waiver status for a teaching credential are for Multiple Subject Instruction: Liberal Studies; and for Single Subject Instruction: Agriculture (12 majors), Agricultural Science, Biological Sciences, English, History, Home Economics, Industrial Technology, Mathematics, Physical Education, Physical Sciences, Political Science, Social Sciences.

## TWO-YEAR TECHNICAL CURRICULA IN AGRICULTURE

All candidates for a technical certificate shall have completed 98 quarter units of courses approved by the department granting the certificate, shall have been in residence at least two quarters immediately preceding graduation, shall have earned not less than 32 quarter units in residence, and shall have earned a total number of grade points at least equal to twice the number of units attempted.

## UNIVERSITY DEVELOPMENT

Gifts from many friends help the university maintain the excellence of its programs. Those friends include alumni, parents of students, faculty, staff, corporations, businesses, and foundations. Their contributions are of significant assistance. They enhance ongoing programs and provide funds for major capital improvements that cannot be financed through State resources.

Contributions made through estate planning and deferred giving have been especially beneficial, both to the university and to the donors. They permit donors to make major gifts whose benefits to the university continue beyond the lifetime of the donor.

Several advisory groups provide valuable help in meeting university needs. The President's Cabinet and the President's Round Table are selected from the various constituencies that the university serves and are active in developing financial support from individuals and corporations. Advisory councils of the various schools of the university provide additional assistance.

The athletic development program is designed to assist in funding athletic scholarships and other athletic program needs such as equipment purchases, recruiting expenses, and special recognition activities not included in the university's budget. To facilitate this effort an athletic support group has been formed with the acronym SUMAT—*S*upporters of *M*ustang *A*thletic *T*eams. The primary purpose of this statewide organization is provide funds from private contributions for scholarships and other needs of student athletes. *SUMAT* membership is open to any alumnus, alumna, friend, business, corporation or individual interested in Cal Poly athletics. The *SUMAT* organization is administered by a board of directors with assistance from staff of the University Relations Office.





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## STUDENT ACTIVITIES

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### THE ASSOCIATED STUDENTS INC.

The Associated Students, Inc. is a nonprofit, student owned and operated corporation. Cal Poly students are shareholders in the ASI by virtue of the fees paid each quarter. The fee supports recreational sports activities, publications, the Children's Center, campus entertainment, and the multitude of cultural, educational and leisure activities available to students.

If a student is interested in working in the corporation, there are many options available; by running for the position of ASI President or Vice President, Student Senator or School Council representative; appointments to the Executive Staff, Finance or Personnel Policy Committees. Other positions are available on the University Union Board of Governors, Program Board; or as representatives on a host of university related committees.

### CAMPUS ORGANIZATIONS

There are over 350 clubs and organizations available on campus, encouraging students to become active in campus life. There are departmental and professional organizations, hobby-interest clubs, honor societies, service clubs, sororities and fraternities, residence groups, ethnic groups, religious faith groups and more.

### CHILDREN'S CENTER

The Cal Poly Children's Center provides child care and family services for student families. Under the auspices of the Associated Students, Inc., the center offers two programs—the Infant-Toddler Program and the Pre-School Program. Both programs are designed to provide a comfortable, loving environment for children and their families. Child care services, health screening, nutritious meals, parent participation, education programs, family referral, and social services are available. The center also serves as a resource for campus academic programs.

### MEDIA

Publications of the Cal Poly student body are not only written and edited by students, but are also printed on campus as laboratory work for students majoring in Graphic Communication. Editorial and photographic work for publications is handled primarily by students of the journalism classes. *Mustang Daily* is the official newspaper of the Associated Students, Inc. In addition, the Journalism Department operates KCPR-FM, a student radio station heard on campus and in the surrounding community.

### POLY ROYAL:

#### *Country Fair on a College Campus*

The largest university open house and spring festival in the Western United States is held on campus, the last weekend in April. Attracting more than 100,000 people annually, the celebration features student prepared exhibits and displays reflecting their studies. Other events include music department concerts, dramatic presentations, a rodeo, club demonstrations, a carnival, various judging contests, and a mathematics contest featuring students from high schools throughout the State.

### THE PROGRAM BOARD:

#### *Entertainment*

Entertainment is one of the special services of the Associated Students Inc., handled through an organization known as the Program Board. Below is a listing of the Board's committees who make entertainment opportunities available at Cal Poly.

- *Films Committee:* brings movies, both old and new, to campus in a theatre setting.



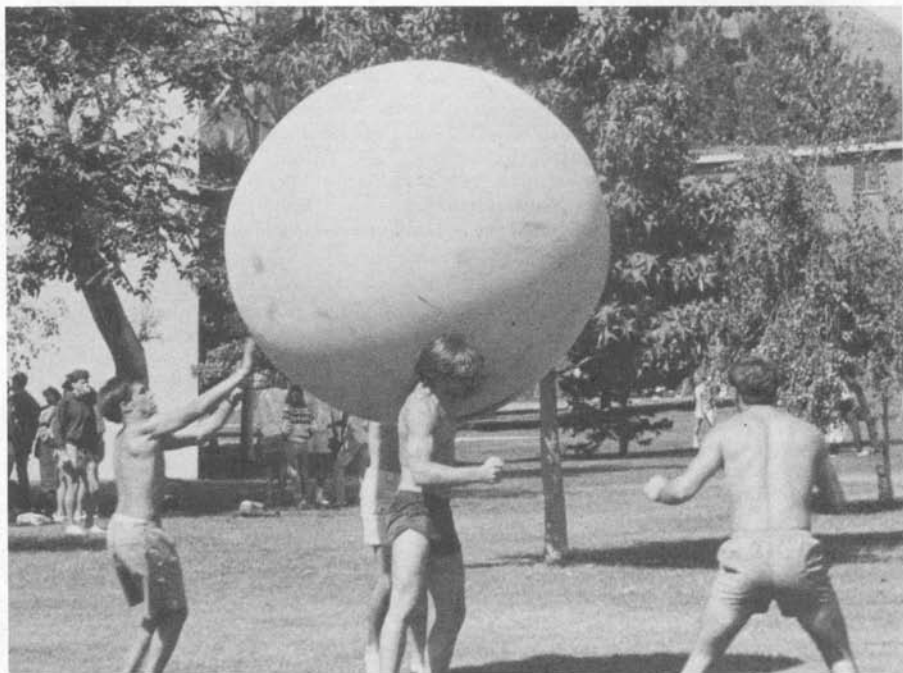
- *Special Events Committee*: sponsors a diverse program including concerts, comedy shows, acrobats and general entertainment. They also feature campus talent weekly during University Hour and monthly at the Thursday Night Amateur Hour.
- *Speakers Forum*: arranges for speakers and panels to explore political, cultural, religious technical and environmental issues.
- *Concerts Committee*: books nationally and internationally-known touring groups, ranging from rock to jazz and punk to country.
- *Fine Arts Committee*: brings the classics to the campus in the form of professional musical ensembles, theatre and dance productions and art exhibitions.

## RECREATION AND LEISURE

The Recreational Sports program offers intramural team sports, club sports, special events and tournaments and provides access to a full line of athletic equipment and facilities. Every quarter team sports offered include: basketball, volleyball and softball, as well as sports like Innertube Water Polo and Floor Hockey. In addition to team sports, there are weekend tournaments for racquetball, tennis and golf, along with special events such as fun runs and a turkey trot.

Other recreational activities available at Cal Poly include:

- *Leisure Classes*: designed to provide high quality, yet inexpensive instruction in noncredit classes ranging from aerobics to guitar and yoga.
- *OARS (Ongoing Access to Recreation and Sports)*: a county-wide program open to all residents with physical disabilities. The staff provides instruction, facilities, equipment, referrals, and recreational programming.
- *Games Area*: the latest electronic video and pinball games and billiard tables for recreational pleasure. Tournaments and special promotions take place during the year.
- *Equipment Checkout*: everything from archery equipment, badminton racquets, frisbees and hacky sacs to jump ropes, basketballs, and water polo gear is available for 24 hour checkout periods available at no charge to students.



- **Sports Clubs:** made up of people with special interests in a particular sport. Below is a list of active club sports at Cal Poly.

Aijukikan Ni  
Badminton  
Bowling  
Crew  
Fencing  
Golf  
Gymnastics  
Judo  
Karate

Koda Kai  
Lacrosse Club  
Racquetball  
Rugby  
Sailing  
Shorin Ryu Karate  
Ski Club  
Soccer

Surfing  
Tae Kwon Do  
Volleyball  
Water Polo  
Ultimate Frisbee  
Water Skiing  
Wheelman  
Windsurfing

## Facilities

The Recreational Sports office runs all the athletic facilities for students, faculty and staff use. The facilities listed below generally are open evenings, weekends and noon hours for independent workouts. A schedule is available in the office at the beginning of each quarter. Use of these facilities is free to students with a valid I.D. card.

Indoor swimming pool  
Outdoor swimming pool  
6 racquetball courts  
18 outdoor tennis courts  
3 indoor basketball courts  
6 outdoor basketball courts

2 weight rooms  
2 gymnasiums  
2 football fields  
Soccer field  
2 440-meter tracks

## STUDENT COMMUNITY SERVICES:

### *People Helping People*

Student Community Services (SCS) offers Cal Poly students an opportunity to share with the community by volunteering their skills and time. Student volunteers can become special "PALS" to kids from single-parent homes, work with developmentally disabled people and assist with the Special Olympics. SCS Tutorial participants help students in grades K through 12 needing help with school work. Members of Senior Services join forces with senior citizen groups. Other special programs include Tay-Sachs testing and Voluntary Income Tax Assistance (VITA).

## THE UNIVERSITY UNION

The Julian A. McPhee University Union is a place for students, faculty, staff, alumni and guests to meet, relax and exchange ideas. It also provides you with a number of vital campus services including eating outlets, the Information Desk, Galerie, Travel Center, Games Area, Craft Center, Second Edition (copy center), Escape Route, T.V. Lounge, Ticket Office, conference rooms, check cashing services, Polywood (video tape and equipment rentals), Chumash Auditorium, Office of Student Life and Activities, ASI Officers and the ASI and University Union Business Office.

## Craft Center

Students can use for free or for a nominal fee, equipment such as a potter's wheel, ceramic glazes, batik waxes and dyes, darkroom facilities, wood lathes, a hobby garage, and hand and power tools. Between 10 and 20 low-cost courses are offered each quarter, such as woodworking, stained glass, batik, silkscreening, lapidary, bike repair, calligraphy and ceramics. An extensive library with information on a variety of leisure crafts and skills is also available.

## Escape Route

Opportunities for outdoor activities are offered by the ASI Outings Committee through the Escape Route. An extensive collection of books, equipment, topographical maps, and other resources on snow camping, bicycle touring, back-packing, canoeing, rock climbing, and other activities, as well as information on state and national parks, is available.



### **The Galerie**

The Galerie offers a changing schedule of modern, historical and educational art exhibits and offers opportunities for volunteer work.

### **Multi-Cultural Center**

The Multi-Cultural Center is a totally student-conceived and student-supported program whose goal is "... to enhance the multi-cultural awareness of the entire university ... ." The center has a resource library dealing with cultural issues, activity files, "culturegrams," and information on the many culturally related events happening on campus and in the surrounding communities.

### **WEEK OF WELCOME**

WOW stands for Week of Welcome—Cal Poly's unique orientation program. The program is planned and operated by students for students, with a peer-helping method that creates a fun, comfortable atmosphere during the orientation. Week of Welcome takes place before school starts in September. Unlike many universities' programs which deal strictly with academics during their orientations, WOW also assists new students with the social and emotional transition to university life. Campus tours are provided for both students and parents along with programs to help them better understand Cal Poly.

Few new students will be familiar with the city of San Luis Obispo, so there is a downtown tour as well. Major points of interest include banks, restaurants, supermarkets, shops, and recreational areas throughout the county. By the end of the week, new students no longer feel like strangers to the town or campus.

### **WOMEN'S WEEK**

With the assistance of the Office of Student Life and Activities and support from the President's Office and Student Affairs, Cal Poly hosts Women's Week each year during Winter Quarter. This has become a university-wide event in which faculty, staff and students work as planners and presenters or simply enjoy the presentations.

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## STUDENT SERVICES

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Cal Poly provides a number of programs and services designed to assist students to gain the most from their college experience. Some of the services are directed toward group activities, others toward helping students on an individual basis. Programs and services aid students in overcoming difficulties, while supporting and encouraging intellectual and personal development.

### COUNSELING SERVICES

The Counseling Center offers assistance and growth experiences for a wide variety of student needs and environmental improvement. Services include counseling, career development, tutorial and learning assistance, and testing. In addition to receiving help in time of crisis, students can develop skills in such areas as communication; problem solving; career planning; decision making; study habits and techniques; and ability, interest, or personality assessment.

Faculty and staff can consult with the Center for help with such areas as group communication, organizational and group processes, career education, learning styles, test construction and other skills which will improve the learning environment for students. Counseling, Testing, and Consultation Services are located in Jespersen Hall, next to Mustang Stadium. The Learning Assistance Center is located in Chase Hall across the street from Jespersen.

### FOOD SERVICE

Food Service on campus is operated by the Cal Poly Foundation. A variety of menus and dining areas is offered to satisfy the varied needs and interests of students. Four campus dining facilities (University Dining Room, Vista Grande Cafeteria, the Sandwich Plant, and the Snack Bar) provide cafeteria service for meal plan and cash customers. For quick snacks, Food Service also operates, on a cash basis, the Burger Bar, Ice Cream Parlour, the Campus Store, the Snak Stop, The Cellar, and additional vending areas. In addition, Vista Grande Restaurant offers full sit-down service for formal occasions, visits with parents, and celebrations, and Campus Catering is available to help you plan your special events.

### Meal Programs

In addition to a la carte and vending services, meal ticket plans are available from the Foundation Business Office. See page 67 for meal plan requirement for resident students.

### FRATERNITIES AND SORORITIES

Eight national fraternities, seven national sororities, and three local fraternities have chapters at Cal Poly. The fraternities are: Alpha Epsilon Pi, Alpha Gamma Rho, Alpha Sigma, Alpha Upsilon, Delta Sigma Phi, Delta Tau, Lambda Chi Alpha, Phi Kappa Psi, Sigma Alpha Epsilon, Sigma Nu, and Theta Chi. The sororities are: Alpha Chi Omega, Alpha Omicron Pi, Alpha Phi, Gamma Phi Beta, Kappa Delta, Sigma Kappa, and Zeta Tau Alpha.

Most of the fraternities and sororities own or lease buildings near the Cal Poly campus. Some fraternities provide lodging and meals for their members and pledges; the sororities house approximately fifteen members each. Students interested in seeking affiliation with a sorority or fraternity should contact the Coordinator for Greek Affairs at the Activities Planning Center.

### HEALTH SERVICES

The primary mission of the Student Health Center is to support the physical and mental well being of all students attending Cal Poly. The fine staff and facilities help minimize class time lost because of illness or injury. This support is provided through outpatient medical care, health education programs, and an inpatient infirmary. Many of these services are available to all students at no additional cost, as outlined below.

## Basic Services

These services are financially supported through the State University Fee paid at registration. Basic outpatient care is available Monday through Friday, year round, 8:00 a.m. to 5:00 p.m. and includes physician and nursing services, specialty clinics, family planning services, clinical laboratory tests, x-ray services, and a pharmacy.

Health education programs are provided by professionals and trained peer educators. Programs include nutrition counseling and family planning education. Also available are workshops on alcohol use/abuse, oral health, sports medicine, and self-help clinics on hayfever, colds, acne, and stress reduction.

## Health Card Program

With purchase of a Health Card, there is no extra charge for additional services including the infirmary, 24-hour emergency care, preventive oral health care, allergy shots, ambulance subsidy, and physical examinations required by employers. Without a Health Card, the services are available to students on a fee-for-service basis. These Health Card services are not available during quarter breaks or summer quarter.

## Supplemental Insurance

Some major medical/surgical problems cannot be treated at the Student Health Center. Student are encouraged to be covered by a major medical and hospital insurance plan (Blue Cross/Blue Shield, Kaiser, etc.). A supplemental policy written for Cal Poly students is available through an insurance company. Contact the Student Health Center for more information.



## HOUSING SERVICES

### Residence Halls

Cal Poly offers on-campus housing accommodations to approximately 2800 students annually. In addition to the convenience which living in one of the many diversified residential hall facilities naturally affords, the program component sponsored throughout the housing system is designed to be a comprehensive and meaningful adjunct to the student's total university experience. Utilizing a philosophic premise of "challenge and support," residence hall staff coordinate a multifaceted approach toward this aspect of student life to allow for a merging of academic assistance and personal growth.

The respective living groups are each monitored by a full-time professional resident director who serves as the staff coordinator. The resident directors provide assistance in counseling, crisis intervention, general referral, judicial concerns, and student advising as well as supervising the department's team of student resident advisers.

Student representatives are elected to serve on governing bodies of the area halls in the fall term of each year. Participants in this student leadership development forum assist in the total development of their hall's community, plan social, recreational and educational offerings, and voice student concerns to affiliated areas of the university community.

Academic assistance is underscored through academic support programs of in-hall tutors; study groups and learning assistance workshops are provided throughout the living units.

New students who wish to live in the residence halls should request on-campus housing by returning their housing application to the Admissions Office. This is found in the "Notice of Space Reservation" booklet. Housing licenses are mailed to students according to a priority system which generally provides first priority to returning students with hardship situations and high priority to new students. Priority for housing is as follows:

1. New undergraduate students, summer or fall quarter, including students who have resided in campus housing for only one quarter, that being the previous spring quarter, and students designated as hardship cases by the Director of Housing, as follows:
  - a. physically handicapped
  - b. close relatives, i.e., a brother who has a younger brother coming to campus
  - c. economic situations verified by Financial Aid
  - d. educational reasons verified by academic departments
2. Returning students by class level (determined by units completed), as follows:
  - a. previous year freshmen
  - b. previous year sophomores
  - c. previous year others
3. Students who are 30 years of age or older may be offered housing by permission of the Director of Housing.

Signed licenses, accompanied by the required payment, must be returned by the deadline stated in the license. Failure to comply with the license stipulations may result in loss of housing assignment.

### LIVING EXPENSES FOR STUDENTS LIVING IN CAMPUS RESIDENCE HALLS

#### (Subject to Change)

Room (academic year) annual license required (double occupancy) .....	\$1,557-1,620
Board, annual (mandatory) (academic year) .....	1,500-1,665
Housing security deposit (payable prior to occupancy) .....	20

Room and board payable in advance. Installments may be made and a service fee shall be charged. Students furnish their own bed spreads and study lamps.

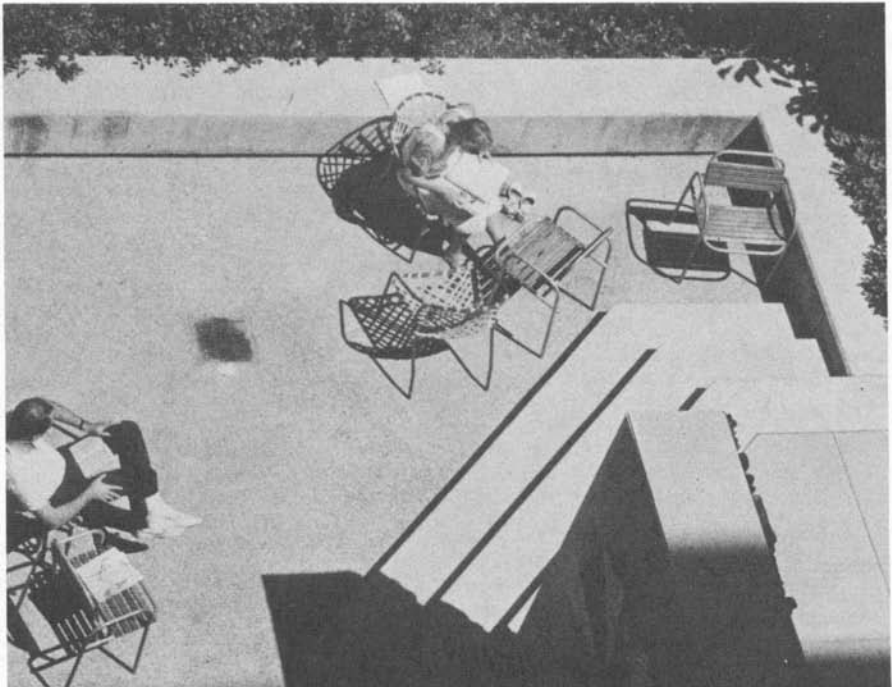
Two meal plans are available. On-campus residence hall students must choose one of these two plans. The 19-meal plan provides a maximum of 19 meals per week at an approximate cost of \$1,665 prepaid for the academic year. The 14-meal plan provides for a maximum of 14 meals per week at an approximate cost of \$1,500 prepaid for the academic year. Students may change from one meal plan to another if written notification is given prior to an installment due date to be effective the following academic quarter.

### Community Housing

The Community Housing Office maintains a listing service of vacant houses, apartments, mobile homes, and an extensive list of private and shared rooms. These listings are for San Luis Obispo and the north and south county areas. Included in the listings is information on rental rates, number of bedrooms, utilities included, location, person to contact, phone number, and any other special features. New listings are posted, rented ones removed, and others modified as soon as the information is made available to the office. The university does not inspect, approve, or disapprove any units offered for rent. The staff assists students with information about where and how to look for housing, things they should know about contracts, deposits, and general information about the community and university.

### PLACEMENT SERVICES

A centralized placement service is available to all students and alumni of the university. The Placement Center and instructional departments work together in assisting students to obtain the most suitable employment consistent with their preparation and experience. Placement Center services focus on the following student-centered objectives: to assist students in determining objectives and subsequent goals; to explore the full range of employment possibilities; and to present the student or graduate effectively as a candidate for employment. To this end, a full complement of programs and services are available through the Student Employment and Career Placement sections of the Placement Center.



## **Student Employment**

On-campus and off-campus part-time and summer employment opportunities are available to students through the Student Employment section of the Placement Center. These opportunities as well as specialized job seeking skills workshops are available on a first-come, first-served basis throughout the year. In addition to the walk-in, self-selection service, a special effort is made to place students in career-related part-time and/or summer employment through the Work Experience and Summer Employment programs. Job information and listings from throughout California and the Western United States are available to students along with a limited number of on-campus interviews. Because of the developmental impact this service has on a student's future career direction, students are encouraged to participate as early in their college experience as possible.

## **Career Placement**

Every prospective graduate of the university should register with the Placement Center no later than the first quarter of the senior year. Teaching credential candidates should register with the Placement Center at least one quarter prior to the initial student teaching assignment. Through workshops and individual advisement, students are guided through the development and implementation of a job search strategy that includes clarifying the job objective, how to identify, research and contact potential employers, preparation of the resume and Educational Placement File, and several employment interview training opportunities. Employer contacts are developed for students on an individual basis, however, a very popular and heavily utilized on-campus interview program is also available. Students also are encouraged to take advantage of the Employer Resource Library which contains a variety of career opportunity brochures, annual reports on the placement of graduates, a summary of job listings by major, current salary offer information, as well as occupational trend reports.

## **STUDENT ACADEMIC SERVICES**

Student Academic Services incorporates the offices of the Educational Opportunity Program, Disabled Student Services, Minority Engineering Program, Student Affirmative Action, Upward Bound, Special Services for the Disadvantaged and Summer Bridge Program. It is a multifaceted, educational support and enhancement program. This program is intended to insure access, academic success and graduation for students from backgrounds that have traditionally been underrepresented within the California State University System.

Services include early outreach; on-site orientation; curriculum advisement; specialized study skills and orientation courses; tutorial services; study facilities; on-campus transportation; special parking permits; loan of adaptive equipment and provision of direct services (readers, notetakers, tutors); faculty and peer mentoring; counseling; campus referrals; career planning; graduate school placement; learning, comprehension and composition skill seminars and classes.



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## INTERCOLLEGIATE ATHLETICS DEPARTMENT

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### Kendrick W. Walker, Director

Steve Beason  
Hugh Bream  
Lennis Cowell  
John Crivello  
Craig Cummings  
Vic Ecklund  
Wolfgang Gartner  
David W. Grosz

Lance Harter  
Becky Heidesch  
Tom Henderson  
Robert Madrigal  
Steve McFarland  
Marilyn McNeil  
Jill Orrock  
Tim Rivera

James D. Sanderson  
Chris Smeland  
Ernest J. Wheeler, Jr.  
Darla Wilson  
Michael Wilton  
Orion Yeast  
Steve Yoneda

Intercollegiate Athletics is administered as a separate department, though students participating on its teams receive academic credit for their efforts in courses offered through the Physical Education and Recreation Administration Department.

All the teams, with the exception of wrestling and women's volleyball, compete at the NCAA Division II level. Wrestling and women's volleyball compete at the Division I level. The football program is a member of the Western Football Conference. Wrestling and women's volleyball compete in the Pacific Coast Athletic Association (PCAA). The balance of the women's and men's programs are in the California Collegiate Athletic Association (CCAA). Through the end of the 1984-85 year, Cal Poly has won 23 NCAA Division II team titles.



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# Admissions, Fees, Financial Aid

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## ADMISSIONS PROCEDURES AND POLICIES

Requirements for admission to California Polytechnic State University, San Luis Obispo are in accordance with Title 5, Chapter 1, Subchapter 3, of the *California Administrative Code*. If you are not sure of these requirements you should consult a high school or community college counselor or the admissions office. Applications may be obtained from the admissions office at any of the campuses of The California State University or at any California high school or community college.

The CSU advises prospective students that they must supply complete and accurate information on the application for admission, residence questionnaire, and financial aid forms. Further, applicants must submit authentic and official transcripts of all previous academic work attempted. Failure to file complete, accurate, and authentic application documents may result in denial of admission, cancellation of academic credit, suspension, or expulsion (Section 41301, Article 1.1, Title 5, *California Administrative Code*).

### Undergraduate Application Procedures

Prospective students, applying for part-time or full-time programs of study, in day or evening classes, must file a complete application as described in the admissions booklet. The \$35 nonrefundable application fee should be in the form of a check or money order payable to The California State University and may not be transferred or used to apply to another term. Applicants need file only at their first choice campus. An alternative choice campus and major may be indicated on the application, but *applicants should list as an alternative campus only that campus of The California State University that they can attend*. Generally, an alternative major will be considered at the first choice campus before an application is redirected to an alternative choice campus. Applicants will be considered automatically at the alternative choice campus if the first choice campus cannot accommodate them.

### IMPACTED PROGRAMS

The CSU designates programs to be impacted when more applications are received in the first month of the filing period than the spaces available. Some programs are impacted at every campus where they are offered; others are impacted at some campuses but not all. The student must meet supplementary admissions criteria if applying to an impacted program.

The CSU will announce before the opening of the fall filing period which programs are impacted and the supplementary criteria campuses will use. That announcement will be published in the *CSU School and College Review*, distributed to high school and college counselors. We will also give information about the supplementary criteria to program applicants.

You must file your application for admission to an impacted program during the first month of the filing period. Further, if you wish to be considered in impacted programs at two or more campuses, you must file an application to each. Nonresident applicants are rarely admitted to impacted programs.

### Supplementary Admission Criteria

Each campus with impacted programs uses supplementary admission criteria in screening applicants. Supplementary criteria may include ranking on the freshman eligibility index, the overall transfer grade point average, and a combination of campus-developed criteria. If you are required to submit scores on either the SAT or the ACT, you should take the test no later than December if applying for fall admission.

The supplementary admission criteria used by the individual campuses to screen applicants appear periodically in the *CSU School and College Review* and are sent by the campuses to all applicants seeking admission to an impacted program.

Unlike unaccommodated applicants to locally impacted programs, who may be redirected to another campus in the same major, unaccommodated applicants to systemwide impacted programs may not be redirected in the same major but may choose an alternative major either at the first choice campus or another campus.

## Application Filing Periods

Terms in 1986-87	Applications First Accepted	Filing Period Duration	Student Notification Begins
Summer Qtr. 1986	Feb. 1, 1986	Each campus accepts applications until capacities are reached. Most campuses accept applications up to a month prior to the opening day of the term. Some campuses will close individual programs earlier.	March 1986
Fall Qtr. 1986	Nov. 1, 1985		Dec. 1985
Winter Qtr. 1987	June 1, 1986		July 1986
Spring Qtr. 1987	Aug. 1, 1986		Sept. 1986

## Space Reservation Notices

Normally, you may expect to receive some form of space reservation notice from your first choice campus within two months of filing the application. A notice that space has been reserved is also a request for records necessary to make the final admission decision. It is an assurance of admission *only* if evaluation of your previous academic record indicates that admission requirements have been met. Such a notice is not transferable to another term or to another campus.

## Hardship Petitions

There are established procedures for consideration of qualified applicants who would be faced with extreme hardship if not admitted. Prospective hardship petitioners should write the Admissions Office regarding specific policies governing hardship admission.

## Undergraduate Admission Requirements

### FIRST-TIME FRESHMAN APPLICANTS

You will qualify for regular admission as a first-time freshman if you

- (1) are a high school graduate
- (2) have a qualifiable eligibility index (see below) and
- (3) have completed with grades of C or better at least four years of college preparatory English and at least two years of college preparatory mathematics.

### Eligibility Index

The eligibility index is the combination of your high school grade point average and your score on either the American College Test (ACT) or the Scholastic Aptitude Test (SAT). For this purpose we compute your grade point average on your final three years of high school studies, excluding physical education and military science.

You can calculate the index by multiplying your grade point average by 800 and adding your total score on the SAT. Or, if you took the ACT, multiply your grade point average by 200 and add 10 times the composite score from the ACT. If you are a California high school graduate (or a legal resident of California for tuition purposes), you need a minimum index of 2994 using the SAT or 722 using the ACT; the table below shows the combinations of test scores and averages required. If you neither graduated from a California high school nor are a legal resident of California for tuition purposes, you need a minimum index of 3402 (SAT) or 826 (ACT).

Applicants with grade point averages above 3.10 (3.60 for nonresidents) are exempt from the test requirement.

**Excerpts from Eligibility Index Table for California  
High School Graduates**

GPA .....	2.00 *	2.20	2.40	2.60	2.80	3.00	3.10 **
ACT Score .....	33	29	25	21	17	13	11
SAT Score .....	1400	1240	1080	920	760	600	520

\* Below 2.00 not eligible.

\*\* Above 3.10 exempt regardless of test score.

## Fall 1988 Admission Requirements

First-time freshman applicants for admission to Cal Poly fall 1988 and later will be required to have completed the following comprehensive pattern of collegiate preparatory studies with grades of C or better:

- 4 years of English
- 3 years of mathematics
- 1 year of U.S. history or U.S. history and government
- 1 year of laboratory science
- 2 years of foreign language
- 1 year in the visual and performing arts
- 3 years of electives selected from English, advanced mathematics, social studies, history, laboratory science agriculture, foreign language, and the visual and performing arts

To phase-in the 1988 comprehensive pattern of subject requirements, applicants otherwise admissible but who are missing one or more of the required subjects may be admitted on condition that they make up the missing subjects early in their program of study at Cal Poly.

The subject criteria are in addition to the criteria that first-time freshman applicants be high school graduates and have a qualifiable eligibility index.

## High School Students

Students still enrolled in high school will be considered for enrollment in certain special programs if recommended by the principal and the appropriate campus department chair and if preparation is equivalent to that required of eligible California high school graduates. Such admission is only for a given program and does not constitute the right to continued enrollment.

## Provisional Admission

Beginning with fall terms 1987, campuses may provisionally admit first-time freshmen applicants based on their academic performance through the junior year of high school. Cal Poly will monitor the senior year of study of those provisionally admitted to ensure that those so admitted complete their senior year of studies satisfactorily, including the required college preparatory subjects, and graduate from high school.

## TRANSFER APPLICANTS

You will qualify for admission as a transfer student if you have a grade point average of 2.0 (C) or better in all transferable units attempted, are in good standing at the last college or university attended, and meet the following standard:

- (a) were eligible as a freshman, or
- (b) were eligible as freshman except for the college preparatory subjects in English and mathematics and have satisfied the subject deficiencies, or

- (c) have completed at least 56 transferable semester (84 quarter) units and have satisfied any deficiencies in college preparatory English and mathematics. (Nonresidents must have a 2.4 grade point average or better).

For these requirements, transferable courses are those designated for that purpose by the college or university offering the courses.

## SUBJECT REQUIREMENTS

The California State University requires that all undergraduate applicants for admission complete with a grade of C or better four years of college preparatory study in English and two years of college preparatory mathematics, or their equivalent. California secondary school courses that meet the subject requirements are listed on "Courses to Meet Requirements for Admission to the University of California," published for, and available at, each high school.

### English

Regular English courses in the 9th and 10th grades that integrate reading and writing will be considered college preparatory. English courses in the 11th and 12th grades will be considered college preparatory if (1) they include writing instruction and evaluation, and require substantial amounts of writing of extensive, structured papers, expressive and analytical, demanding a high level of thinking skills; and (2) they are integrated with challenging, in-depth reading of significant literature.

Courses in speech, drama, or journalism will be considered college preparatory if they meet the criteria for 11th and 12th grade courses. Two consecutive semesters of advanced English as a Second Language may be substituted for two semesters of college preparatory English. Remedial reading and writing courses at any level will not be accepted nor will courses in beginning or intermediate English as a Second Language.

### Mathematics

College preparatory courses in mathematics include algebra, geometry, trigonometry, calculus, and mathematical analysis. Most students will have taken at least algebra and geometry or two years of algebra. Business or technical mathematics, arithmetic, or prealgebra are not considered college preparatory.

## ADDITIONAL COLLEGE PREPARATORY COURSES RECOMMENDED

Most academic advisers agree that preparation for university study includes preparation in subjects beyond four years of English and two years of mathematics. Bachelor's degree curricula build upon previous study in the natural sciences, social sciences, visual and performing arts, foreign languages, and the humanities. Students planning to major in mathematics, the sciences (including computer science), engineering, premedicine, other science-related fields, business, or economics should complete four years of college preparatory mathematics. Students in the social sciences and pre-professional fields of study should include at least three years of mathematics in the preparatory studies. Further, all students should include English and mathematics in the final year of high school.

*Please note the section above on Fall 1988 Admission Requirements.*

### Honors Courses

Grades in up to eight semester courses, taken in the last two years of high school, that are designated honors in approved subjects receive additional points in grade point average calculations. Each unit of A in approved courses will receive a total of 5 points; B, 4 points; C, 3 points; D, 1 point; and none for F grades.

## Tests, Placement

### TEST REQUIREMENTS

Freshman and transfer applicants who have fewer than 56 semester or 84 quarter units of transferable college work must submit scores from either the Scholastic Aptitude Test of the College Board (SAT) or the American College Testing Program (ACT). At Cal Poly test scores are required of *all* transfer applicants. You may get registration forms and the dates for either test from school or college counselors or from a campus Testing Office. Or, you may write to:

#### ACT Address

American College Testing Program  
Registration Unit, P.O. Box 168  
Iowa City, Iowa 52240

#### SAT Address

The College Board  
Registration Unit, P.O. Box 592  
Princeton, New Jersey 08541

### TOEFL Requirement

All undergraduate applicants, regardless of citizenship, whose preparatory education was principally in a language other than English must demonstrate competence in English. Those who have not attended for at least three years schools at the secondary level or above where English is the principal language of instruction must earn a minimum score of 550 on the Test of English as a Foreign Language (TOEFL).

### SYSTEMWIDE TESTS REQUIRED OF MOST NEW STUDENTS

The CSU requires new students to be tested in English and mathematics after they are admitted. These are not admissions tests, but a way to determine if you are prepared for college work and, if not, to counsel you how to strengthen your preparation. You might be exempted from one or both of the tests if you have scored well on other specified tests or completed appropriate courses.

### English Placement Test (EPT)

The CSU English Placement Test must be completed by all new nonexempt undergraduates. This applies to all nonexempt students with fewer than 56 transferable semester units. It also applies to those nonexempt students with 56 or more transferable semester units who are subject to the 1986-87 or later campus catalog or bulletin. Exemptions from the test are given only to those students who can present proof of one of the following:

- a score of 3, 4, or 5 on either the Language and Composition or the Composition and Literature examination of the College Board Advanced Placement Program
- a satisfactory score on the CSU English Equivalency Examination
- a score of 510 or above on the Verbal section of the College Board Scholastic Aptitude Test (SAT-Verbal)
- a score of 23 or above on the ACT English Usage Test.
- a score of 600 or above on the College Board Achievement Test in English Composition *with essay*
- completion of an acceptable college course in English composition of four-quarter or three-semester units with a grade of C or better.

Failure to take the English Placement Test, as required, at the earliest opportunity after admission may lead to administrative probation which, according to Section 41300.1 of Title 5, *California Administrative Code*, and CSU Executive Order 186, may lead to disqualification from future attendance.

The results of the EPT will not affect admissions eligibility but will be used to identify students who need special help in reading and writing in order to do college-level work.

**Students may not enroll in freshman composition (ENGL 114) without taking the EPT.**

Information bulletins and registration materials for the EPT will be mailed to all students subject to these requirements. The materials also may be obtained from the Testing Office or the Writing Skills Program Office.



## Entry Level Mathematics (ELM) Test

All new undergraduate students must take the test and *pass it* before enrolling in a course that satisfies the college level mathematics requirement of the General Education-Breadth program. Exemptions from the test are given only to those students who can present proof of one of the following:

- a score of 3 or above on the College Board Advance Placement Mathematics examination (AB or BC)
- a score of 530 or above on the Mathematics section of the Scholastic Aptitude Test (SAT-Math)
- a score of 23 or above on the ACT Mathematics Test
- a score of 520 or above on the College Board Math Achievement Test, Level 1
- a score of 540 or above on the College Board Math Achievement Test, Level 2
- completion of a college course that satisfies the General Education-Breadth Requirement in Quantitative Reasoning, provided it is at the level of intermediate algebra or above with a grade of C or better.

Failure to take the Entry Level Mathematics Examination at the earliest opportunity after admission may lead to administrative probation which, according to Section 41300.1 of Title 5 of the *California Administrative Code*, CSU Executive Order 393, and CSU Executive Order 416, may lead to disqualification from future attendance. The results of the ELM test will not affect admissions eligibility.

Information bulletins and registration materials for the ELM will be mailed to students subject to these requirements. The materials also may be obtained from the Office of Admissions and Records, the Testing Office, and the Mathematics Department.

## CAL POLY MATHEMATICS PLACEMENT EXAMINATION

The Cal Poly Mathematics Placement Examination (MAPE) is an examination used to place students in the appropriate mathematics course. Students enrolling in MATH 118, 119, 120, 121, 131, 141, or 221 are subject to this exam. Failure to take the MAPE may delay enrollment in key courses with mathematics prerequisites.

Information bulletins and registration materials for MAPE are mailed to students admitted for fall quarter. Students enrolled in these classes admitted other quarters will receive in-class information. Questions regarding the MAPE may be directed to the Testing Office.

## ADVANCED PLACEMENT

Cal Poly grants credit toward its undergraduate degrees for successful completion of examinations of the Advanced Placement Program of the College Board. Students who present scores of three or better will be granted nine quarter units of college credit.

## CREDIT FOR MILITARY SERVICE

Nine quarter units of elective credit will be allowed toward graduation to any student with an honorable discharge submitting evidence of satisfactory completion of one year of training in the military service of the United States. Credit is allowed in accordance with the recommendations by the Commission on Educational Credit and Credentials of the American Council on Education. The number of units allowed are those recommended in the *Guide to the Evaluation of Educational Experience in the Armed Services*.

Credit is not given for completion of the six-month Reserve Training Programs or for college level General Educational Development Tests. No grade points are assigned in connection with units of credit allowed for military service. The units allowed are not included in scholarship computations.

## CREDIT BY EXAMINATION

A petition for credit by examination may be submitted by a regularly enrolled student requesting permission to obtain credit by examination for courses in subject matter fields in which he is especially qualified through previous education or experience and for which credit has not otherwise been given. A credit by examination request will not be considered for a course in which the student is enrolled, or for which a student has received a failing or "NC" grade at Cal Poly, or for which a student has previously unsuccessfully attempted credit by examination. A fee is charged for such an examination. The examination may include written, oral, or skills tests, or a combination of all three types, and will be sufficiently comprehensive to determine that the student has essentially the same knowledge and skills as those students who successfully complete the course. The grade received is entered on the student's permanent record. The grade may not be Credit/No Credit. The length of the examination will be consistent with the unit value of the course.

There are certain College Level Examination Program (CLEP) tests which are acceptable for credit when completed with an appropriate score. Information on which tests are acceptable, the amount of credit that will be given and how the credit will be applied for meeting the requirements of your degree can be obtained from the Evaluations Office.

Credit for CLEP and other externally developed examinations will *not* be awarded if any of the following apply:

- Examination previously taken within the past year;
- Equivalent degree credit or duplicate credit has already been granted;
- Credit has been granted for previous course work or for a previously completed more advanced or higher level examination;
- Total amount of credit awarded for externally developed tests exceeds 45 quarter units (Advanced Placement Examination credit excluded from this limit).

Arrangements to obtain course credit by examinations may be made with the head of the department in which the course is taught. Units of credit received through this procedure may not apply toward the residence requirements for any of the degrees or credentials offered by the university.

Detailed instruction for applying for credit by examination may be obtained from the Records Office.

## Other Admissions Information

### ADULT STUDENTS

As an alternative to regular admission criteria, an applicant who is 25 years of age or older may be considered for admission as an adult student if he or she meets the following conditions:

- Possesses a high school diploma (or has established equivalency through either the Tests of General Educational Development or the California High School Proficiency Examination).
- Has not been enrolled in college as a full-time student for more than one term during the past five years.
- If there has been any college attendance in the past five years, has earned a C average or better.

Consideration will be based upon a judgment as to whether the applicant is as likely to succeed as a regularly admitted freshman or transfer and will include an assessment of basic skills in the English language and mathematical computation.

### INTERNATIONAL (FOREIGN) STUDENTS

To be considered for admission from a foreign country, an applicant must meet separate requirements in addition to those listed for American students at the same class level. These requirements are:

- Two official English translations of transcripts covering all high school and college work attempted.
- An official copy of the score on the Test of English as a Foreign Language (TOEFL).
- Certification of financial responsibility.

Application forms must be submitted to the Admissions Office during the appropriate initial filing period. Supporting documents must be submitted early enough to allow for the processing of the application and necessary travel documents.

## GRADUATE ADMISSION

For information regarding graduate application procedures and admissions, see "Graduate Studies" section of this catalog.

## PLANNED EDUCATIONAL LEAVE

The Planned Educational Leave Program makes it possible for students who obtain the necessary approval in advance to leave school for up to two calendar years without being subject to regular readmissions procedures.

1. Planned Educational Leave must be for purposes which will contribute to the student's educational objective.
2. A student on educational leave will be considered to be in continuous attendance for the purpose of returning to the same curriculum as that in effect at the time of the beginning of the leave.
3. A student on educational leave will not be required to apply for readmission or pay an application fee provided that: a) the student is in good academic standing, and returns in the same major and b) the student returns within the time period agreed on at the time of application for leave.
4. A student who decides to return earlier than planned must notify the Admissions Office in writing at least 30 days before the anticipated registration date.
5. An application for educational leave must be initiated and approved before the leave begins. Educational leaves will not be granted retroactively.

Application forms for Planned Educational Leaves may be obtained from the Admissions Office.

## RETURNING STUDENTS

Matriculated students who have been absent from the university for two or more quarters must file an application for readmission. If the absence has been for two quarters only (nonmatriculated students must file each term), and no other institution has been attended during the absence, no application fee is required. If the student was not matriculated, if the absence has been for three quarters or more, or if the student has attended another institution during the absence, the \$35 application fee must accompany the application for readmission. To be given full consideration, applications for readmission should be filed during the appropriate filing period. Summer Quarter is a regular quarter and is counted in determining the length of absence.

## MEASLES AND RUBELLA IMMUNIZATIONS Health Screening Provisions

The campus shall notify certain students, born after January 1, 1957, of the CSU requirement to present proof of measles and rubella immunizations by the beginning of the next term of enrollment. At the beginning of the next term of enrollment, those so notified who have not presented acceptable proof of the immunizations shall be notified further of the need to comply before receiving registration materials to enroll for the succeeding term.

Persons subject to these health screening provisions include:

- New students enrolling fall 1986 and later;
- Readmitted students reenrolling fall 1986 and later;
- Students who reside in campus residence halls;
- Students who obtained their primary and secondary schooling outside the United States;

- Students enrolled in dietetics, medical technology, and any practicum, student teaching, or field work involving preschool-age children, school-age children, or taking place in a hospital or health care setting.

The Student Health Center shall provide immunizations without cost to those students unable to obtain acceptable proof of immunizations.

## **DETERMINATION OF RESIDENCE FOR NONRESIDENT TUITION PURPOSES**

The campus Admissions Office determines the residence status of all new and returning students for nonresident tuition purposes. Responses to the Application for Admission and, if necessary, other evidence furnished by the student are used in making this determination. A student who fails to submit adequate information to establish a right to classification as a California resident will be classified as a nonresident.

The following statement of the rules regarding residency determination for nonresident tuition purposes is not a complete discussion of the law, but a summary of the principal rules and their exceptions. The law governing residence determination for tuition purposes by The California State University is found in *Education Code* Sections 68000–68090, 68121, 68123, 68124, 89705–89707.5, and 90408 and in Title 5 of the *California Administrative Code*, Sections 41900–41912. A copy of the statutes and regulations is available for inspection at the campus Admissions Office.

Legal residence may be established by an adult who is physically present in the state and who, at the same time, intends to make California his or her permanent home. Steps must be taken at least one year prior to the residence determination date to show an intent to make California the permanent home with concurrent relinquishment of the prior legal residence. The steps necessary to show California residency intent will vary from case to case. Included among the steps may be registering to vote and voting in elections in California; filing resident California state income tax forms on total income; ownership of residential property or continuous occupancy or renting of an apartment on a lease basis where one's permanent belongings are kept; maintaining active resident memberships in California professional or social organizations; maintaining California vehicle plates and operator's license; maintaining active savings and checking accounts in California banks; maintaining permanent military address and home of record in California if one is in the military service.

The student who is within the state for educational purposes only does not gain the status of resident regardless of the length of the student's stay in California.

In general, the unmarried minor (a person under 18 years of age) derives legal residence from the parent with whom the minor maintains or last maintained his or her place of abode. The residence of a minor cannot be changed by the minor or the minor's guardian, so long as the minor's parents are living.

A married person may establish his or her residence independent of his or her spouse.

An alien may establish his or her residence, unless precluded by the Immigration and Nationality Act from establishing domicile in the United States. An unmarried minor alien derives his or her residence from the parent with whom the minor maintains or last maintained his or her place of abode.

Nonresident students seeking reclassification are required by law to complete a supplemental questionnaire concerning financial independence.

The general rule is that a student must have been a California resident for at least one year immediately preceding the residence determination date in order to qualify as a "resident student" for tuition purposes. A residence determination date is set for each academic term and is the date from which residence is determined for that term. The residence determination dates for 1985-86 academic year are:

Fall.....	September 20
Winter.....	January 5
Spring.....	April 1
Summer.....	July 1

Questions regarding residence determination dates should be directed to the campus Admissions Office which can give you the residence determination date for the term for which you are registering.

There are exceptions from nonresident tuition, including:

1. Persons below the age of 19 whose parents were residents of California but who left the state while the student, who remained, was still a minor. When the minor reaches age 18, the exception continues for one year to enable the student to qualify as a resident student.
2. Persons who have been present in California with the intent of acquiring residence for more than a year before the residence determination date, and entirely self-supporting for that period of time.
3. Persons below the age of 19 who have lived with and been under the continuous direct care and control of an adult, not a parent, for the two years immediately preceding the residence determination date. Such adult must have been a California resident for the most recent year.
4. Dependent children and spouses of persons in active military service stationed in California on the residence determination date. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for a year. The exception, once attained, is not affected by retirement or transfer of the military person outside the state.
5. Military personnel in active service stationed in California on the residence determination date for purposes other than education at state-supported institutions of higher education. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for a year.
6. Certain credentialed, full-time employees of California school districts.
7. Full-time State University employees and their children and spouses. State employees assigned to work outside the State and their children and spouses. This exception applies only for the minimum time required for the student to obtain California residence and maintain that residence for one year.
8. Certain exchange students.
9. Children of deceased public law enforcement or fire suppression employees, who were California residents, and who were killed in the course of law enforcement or fire suppression duties.

Any student, following a final campus decision on his or her residence classification, only may make written appeal to:

The California State University  
Office of General Counsel  
400 Golden Shore  
Long Beach, California 90802-4275

within 120 calendar days of notification of the final decision on campus of the classification. The Office of General Counsel may make a decision on the issue, or it may send the matter back to the campus for further review. Students classified incorrectly as residents or incorrectly granted an exception from nonresident tuition are subject to reclassification as nonresidents and payment of nonresident tuition in arrears. If incorrect classification results from false or concealed facts, the student is subject to discipline pursuant to Section 41301 of Title 5 of the *California Administrative Code*. Resident students who become nonresidents, and nonresident students qualifying for exceptions whose basis for so qualifying changes, must immediately notify the Admissions Office. Applications for a change in classification with respect to a previous term are not accepted.

The student is cautioned that this summation of rules regarding residency determination is by no means a complete explanation of their meaning. The student should also note that changes may have been made in the rate of nonresident tuition, in the statutes, and in the regulations between the time this catalog is published and the relevant residence determination date.

## FEES AND EXPENSES

### STATE UNIVERSITY FEE

In September 1984 the Board of Trustees adopted major new policies with regard to state required registration fees. Under the new policy, the Student Services Fee was combined with the State University Fee. The combined fee is identified as the State University Fee which is divided into two categories depending on the number of units for which a student is registered. Students may register for up to six units at the lower rate. The higher rate is charged if the total units taken exceeds six. State University Fee increases are limited to a maximum of 10% in any one year.

### SCHEDULE OF FEES

Fees listed below were in effect at the time this catalog was printed and are for informational purposes only. This list is not to be used as a schedule of current fees. Unless otherwise noted, fees indicated are per quarter. Fees and tuition are subject to change without advance notice by the Trustees of The California State University. Please consult the current *Class Schedule* for the fees that are applicable to the quarter in which you are registering. If your check or charge slip is returned by the bank for any reason, your registration may be cancelled and you will be charged a bad check processing fee.

No fees of any kind shall be required of or collected from those individuals who qualify for such exemption under the provisions of the Alan Pattee Scholarship Act.

#### Registration Fees Per Quarter

All regularly enrolled students, both undergraduate and graduate, pay registration fees determined by the number of units attempted per quarter. Legal residents of California are not charged tuition. In addition to registration fees, nonresident and foreign students pay tuition fees.

	0-6.0 units	more than 6 units
State University Fee .....	\$122.00	\$210.00
Associated Students Fee .....	15.00	15.00 *
Facility Fee .....	2.00	2.00
Instructionally Related Activities Fee .....	8.00	8.00
University Union Fee .....	20.00	20.00 †
Total registration fees per quarter .....	\$167.00	\$255.00

#### Late Registration

Late registration fee (See *Class Schedule* for dates when this fee will be assessed.) ..... \$25.00

#### Tuition for Nonresident Students

Nonresident tuition per quarter unit ..... \$94.00

#### Health Services, Room and Board (On-Campus)

Health fee (for optional services):

Academic year ..... \$65.00  
 Quarterly ..... 30.00

\* Fall quarter fee. Associated Students Fee for winter and spring quarters, each quarter, is \$10.00 and summer quarter is \$8.00

† University Union Fee for summer quarter is \$10.00

Room, annual license, double occupancy. Fee indicated does not include deposit or installment charge.

Academic year .....	1,557.00–1,620.00
Summer quarter .....	500.00
Housing security deposit (payable prior to occupancy) .....	20.00

Meals (approximate cost)

19 meals per week, academic year.....	1,665.00
14 meals per week, academic year.....	1,500.00

### Parking Fees

Less than 4-wheel vehicle, 25% of listed fee.

Quarterly .....	\$22.50
Quarterly pool (2 or more vehicles), each pool .....	22.50
Daily permits .....	0.75
Weekly permits .....	2.25

### Miscellaneous Fees

Application fee (nonrefundable) .....	\$35.00
Campus services card fee (Photo I.D. card, first time and replacement charge) .....	\$5.00
Check returned for any cause .....	10.00
Cooperative Education (per quarter unit) .....	44.00
Extension course fees (per quarter unit):	
Lecture and discussion .....	37.50
Activity .....	48.00
Laboratory .....	68.00
Administrative (contract) .....	12.50
Failure to meet administratively required appointment or time limit .....	2.00 to 10.00
Library fees .....	see schedule in library
Special examination fee (per examination) .....	cost to 25.00
Sponsored Student Fee (per quarter) .....	100.00
Summer session fee (per quarter unit) .....	40.00
Thesis binding fee .....	2.00 to 10.00
Transcript of record (cost varies with number ordered) .....	4.00

### REFUND OF FEES

Details concerning fees which may be refunded, the circumstances under which fees may be refunded, and the appropriate procedure to be followed in seeking refunds may be obtained by consulting Section 41803 (parking fees), 41913 (nonresident tuition), 42019 (housing charges), and 41802 (all other fees) of Title 5, *California Administrative Code*. In all cases it is important to act quickly in applying for a refund. Information regarding which fees may be refunded and the appropriate procedures to follow is published in the quarterly *Class Schedule* in the section entitled "Additional Registration Information." Additional information concerning any aspect of the refund of fees may be obtained from the Records Office or the University Cashier.

### DEBTS OWED TO THE UNIVERSITY

Should a student or former student fail to pay a debt owed to the university, the university may "withhold permission to register, to use facilities for which a fee is authorized to be charged, to receive services, materials, food or merchandise or any combination of the above from any person owing a debt" until the debt is paid (see Title 5, *California Administrative Code*, Sections 42380 and 42381). For example, the university may withhold permission to receive official transcripts of grades from any person owing a debt. If a student believes that he or she does not owe all or part of an unpaid obligation, the student should contact the campus business office. The business office, or another office on campus to which the student may be referred by the business office, will review the pertinent information, including information the student may wish to present, and will advise the student of its conclusions with respect to the debt.

## CREDIT CARDS

VISA and Master Charge bank credit cards may be used for payment of Student Fees and the purchase of meal tickets from the University Foundation, theatre tickets from the Cal Poly Theatre Box Office, health cards from the University Health Center, Bookstore purchases and for Extended Education fees. No other use of credit cards is authorized.

## PROCEDURE FOR THE ESTABLISHMENT OF A STUDENT BODY FEE

The law governing The California State University provides that a student body fee may be established by student referendum with the approval of two-thirds of those students voting. The Student Body Fee (also called the Associated Student Fee or ASI Fee) was established at California Polytechnic State University, San Luis Obispo by student referendum on April 8 and 9, 1981. The same fee can be abolished by a similar two-thirds approval of students voting on a referendum called for by a petition signed by 10% of the regularly enrolled students ( *Education Code*, Section 89300). The level of the fee is set by the Chancellor. An increase in the student body fee may be approved by the Chancellor only following a referendum on the fee increase approved by a majority of students voting. Student body fees support a variety of cultural and recreational programs, child care centers, and special student support programs.





## FINANCIAL AID

The university has a variety of grants, loan funds, scholarships, and part-time employment opportunities designed to assist students financially. Students who need assistance in order to complete their college work should read this section carefully. Additional current information may be obtained by writing to the Financial Aid Office for a copy of the Financial Aid brochure.

The application for Financial Aid is called the Student Aid Application for California (SAAC). It may be obtained from any university or college financial aid office or any California high school. Scholarship applications must be requested directly from the Financial Aid Office.

The deadline for filing the Student Aid Application for California (SAAC) to College Scholarship Service (CSS) is March 1. Applicants must send the appropriate filing fee along with the SAAC to College Scholarship Service, Box 70, Berkeley, CA 94701.

### TYPICAL STUDENT EXPENSES

Following is an estimate of typical expenses per quarter for the average California resident student living in campus residence halls. Charges for room and board are payable in advance or in installments. Nonresident students should be prepared to pay tuition and fees. For the 1986-87 school year nonresident tuition was \$94 per unit. Please see the "Fees and Expenses" section of this catalog for more information. All State fees are subject to change upon approval by the Board of Trustees of The California State University.

#### Estimated Expenses per Quarter:

Registration fees .....	255
Health fee—optional per quarter .....	30
Room and board with 19-meal ticket.....	1,150
Books and supplies (estimated)† .....	120
Personal expenses and transportation .....	471
Estimated total per quarter.....	\$2,021

## UNIVERSITY SCHOLARSHIPS

### General Information

Over 750 scholarships a year are awarded or confirmed by the California Polytechnic State University Scholarship Committee. Applications that are received by the Financial Aid Office are transmitted to the Scholarship Committee, where each is reviewed in terms of the student's financial need, scholastic ability, participation in school and community affairs, and interest in chosen major. Some Cal Poly scholarships have certain requirements regarding field of study, area of residence, year in school, and project or design portfolios.

Generally, a student must have at least an over-all grade point average of 3.0 to be granted a scholarship award. There are some scholarships, however, which are given to students with lower grade point averages who meet certain criteria of need, a specific field of study, or other special qualifications. *If you are in doubt about your eligibility or have not received word on your admission status to Cal Poly, be sure to apply by the filing deadline.*

† Beginning engineering and architecture students should be prepared to pay up to \$170 in their first quarter for books and supplies.

## How to Apply

*Annual Deadline Date: March 1 for the following academic year*

The California Polytechnic State University Scholarship Application (available in January from the Financial Aid Office) should be filled out completely. Two reference forms are included as part of the application and each one should be completed by an individual who can attest to the student's ability to profit from a college education, need for financial assistance, leadership abilities, and interest and participation in school activities. A Student Aid Application for California (SAAC) is also required and should be submitted to the College Scholarship Service (designating Cal Poly to receive a copy) well in advance of the filing date, to insure ample time for processing.

## Scholarship Notifications

Typically, the California Polytechnic State University Scholarship and Awards Committee meets in April to confirm scholarship awards. During the months of May and early June, scholarship award letters will be forwarded to the recipients. The student will be informed of the scholarship amount, how it will be disbursed during the school year, and of the requirement for maintaining full-time enrollment status while receiving the scholarship. According to the donors' specifications, recipients of the Hessellund, Turner, VanDyke and Wrasse Scholarships will be required to verify that they have earned between \$250 and \$500 for the previous year.

As scholarships are awarded for an academic year and disbursed in increments for Fall, Winter, and Spring (with an exception for Architectural Scholarships), the award will be prorated accordingly should graduation during mid-year or withdrawal from school occur.

Unfortunately, there are not enough funds to be awarded to all students who apply for the Cal Poly scholarships. Students not selected will be so notified, with the possibility of being placed on an alternate list. Occasionally scholarship recipients cannot accept their awards and the Scholarship Committee will then choose an alternate student, according to their ranking order, as a replacement.

## ALAN PATTEE SCHOLARSHIPS

Children of deceased public law enforcement or fire suppression employees, who were California residents and who were killed in the course of law enforcement or fire suppression duties, are not charged fees or tuition of any kind at any California State University campus, according to the Alan Pattee Scholarship Act, *Education Code* Section 68121. Students qualifying for these benefits are known as Alan Pattee scholars. For further information contact the Admissions/Registrar's Office, which determines eligibility.

## GENERAL SCHOLARSHIPS

R. W. Andrews Scholarships  
Lulu Grumbles Bumphrey Scholarships  
California Polytechnic State University  
Memorial Scholarships  
California Polytechnic State University  
Women's Club Scholarship  
Cal Poly Parents' Association Scholarship  
California Rural Rehabilitation Scholarships  
Felix Camacho-Betteravia Farms  
Scholarships  
Chinese Association Scholarships  
Herbert E. Collins Scholarships  
Bing Crosby Youth Fund Scholarship

Green and Gold Barbecue Scholarship  
Regnar Hessellund Scholarships  
H<sub>2</sub>O Scholarship for Children of Migrant  
Labor Parents  
Michelle Ann Jacobson Memorial Scholarship  
Julian A. McPhee Award  
Army-ROTC  
Helen V. Sandercock Scholarships  
William and Adelaide Sandercock  
Scholarships  
William B. Turner Scholarships  
J. Van Dyke Memorial Scholarships

## AGRICULTURE

Catherine C. Adams Scholarships  
 Barling Memorial Scholarships  
 Paul Belveal Memorial Forestry  
 Scholarships  
 L. L. Bennion Scholarship  
 Danny Bettencourt Memorial Scholarships  
 California Agri-Fair Scholarships  
 California Association of  
 Nurserymen-Peninsula  
 Chapter Scholarship  
 California Cowbelles Scholarship  
 California Dairy Industries Association  
 Scholarship  
 California PTA Scholarships  
 California State Grange Scholarships  
 Earl J. Cecil Educational Foundation  
 Scholarships  
 Claire Davis Clark Scholarship  
 Agnese Davey Scholarship  
 Rose Davey Scholarship  
 Wellington Davey Scholarship  
 Dr. Arnold Dean Scholarship  
 General Dillingham Produce Industry  
 Scholarships  
 Dorothy Bancroft Drasel-Redwood Empire  
 Chapter Scholarship  
 Kenneth H. Easter Scholarship  
 Environmental Industries, Inc., Scholarship  
 Paul Etchechury Memorial Scholarship  
 Food Processor Sanitation Association  
 Scholarship  
 J. Cordner Gibson Scholarship  
 Ray Hansen Memorial Scholarship  
 William Randolph Hearst Foundation  
 Scholarships  
 William (Ben) and Helen Holman Alumni  
 Scholarship  
 International Agriculture Fellowships

Robert Matthew Kies Scholarships  
 Kings River Prune and Apricot Scholarships  
 Knudsen Foundation Scholarship  
 E. C. Loomis and Son Scholarship  
 Los Angeles County Fair Association  
 Scholarship  
 Lucky Stores Scholarships  
 Michael L. Martin Scholarship  
 Chester O. McCorkle, Sr. Memorial  
 Scholarship  
 Ole Meland Scholarship  
 James F. Merson Memorial Scholarship  
 Moorman's Scholarship  
 Dan Nikkel Memorial Scholarship  
 Harry Parker Memorial Scholarship  
 Roland Pautz Scholarship  
 Charles and Helen Penwell Scholarship  
 Pi Alpha Xi-Howard C. Brown Scholarship  
 Poultrymen's Cooperative Association  
 Scholarship  
 Rain for Rent, Inc. Irrigation Scholarship  
 in Memory of Paul Etchechury  
 Rancho Santa Fe Garden Club Scholarship  
 Dante Righetti Scholarships  
 Rodeo Club Scholarships  
 Harry Rosedale Memorial  
 (Monrovia Nursery) Scholarship  
 San Luis Obispo Lions Club/  
 Food Industries Scholarship  
 Louis H. and Stella S. Soares Achievement  
 Award  
 Herman M. Sperber Scholarship  
 Stardust Jersey Farm Scholarship  
 Harmon Toone Scholarship  
 Eric C. Twist Memorial Scholarship  
 War Veterans Scholarship  
 Richard Alex Wilson Scholarship  
 Leopold Edward Wrasse Scholarships

## ARCHITECTURE AND ENVIRONMENTAL DESIGN

Stephen O. Anderson Memorial Scholarship  
Wallace W. Arendt Scholarship  
Bechtel Affirmative Action Award  
Bechtel Corporation Scholarships  
Black Students in School of Architecture  
and Environmental Design Scholarship  
Calmat Company Scholarship  
Environmental Industries, Inc., Scholarship  
Golden Eagle Award  
Thor Gulbrand Memorial Scholarship  
Kawasaki/Theilacker Scholarship  
D. Stewart Kerr Scholarships

Kiewit-Pacific Scholarship  
Landscape Architectural Scholarship Funds  
Alice C. Loh Competition Award  
Warren Ludvigsen Memorial Scholarship  
Julia Morgan/Phoebe Hearst Architecture  
Scholarships  
Professional Architects Scholarship  
Rain Bird Sales, Inc., Scholarships  
Michael Theilacker Editorship  
Wong-Brocchini Scholarships  
Frederick Peter Young Scholarships

## BUSINESS

Arthur Andersen and Company  
Scholarships  
Carpenter, Kuhn and Sprayberry Scholarship  
Central Coast Chapter of California  
Society of CPAs  
Controller's Roundtable of San Luis Obispo  
County Scholarship  
H. S. Crocker Company-Roland  
Meyer Memorial Scholarship

Ernst and Whinney Scholarship  
Frank and Norma Exter Scholarship  
Charles Wyndham Flanagan Scholarship  
Jeffrey W. Land Scholarship  
Peat, Marwick, Mitchell Scholarship  
Price Waterhouse Scholarship  
Larry Ratner Scholarship  
Touche Ross Scholarship

## ENGINEERING

Alcoa Foundation Scholarships  
American Institute of Aeronautics and  
Astronautics Scholarships,  
Vandenberg Section  
American Microsystems, Inc., Assistantships  
American Society of Heating, Refrigeration  
and Air-Conditioning Engineers Scholar-  
ships (ASHRAE)  
Sacramento Chapter  
San Jose Chapter  
Southern California Chapter  
Arthur Andersen and Company Scholarship  
Bechtel Corporation Scholarships  
Boeing Company Scholarships  
Chevron USA Inc.—Standard Oil Company  
Scholarships  
Comm-Air Energy Conservation  
Scholarship  
Allan R. Davis Scholarship  
Fluid Power Educational Foundation  
Scholarship  
Fluor Engineering Scholarship—Southern  
California Division

FMC Corporation Scholarship  
Harold R. Frank—Applied Magnetics  
Corporation Scholarships  
Karl Gulbrand Memorial Scholarship  
Glenn A. Hubbard Memorial Scholarship  
—Experimental Aircraft Association  
Peter Kiewit Sons' Company Scholarship—  
Omaha Branch  
Elgin Knott Memorial Scholarships  
National Action Council for Minorities in  
Engineering Scholarships  
Frank E. Pilling, Sr., Scholarship  
Roy N. Poage Memorial Scholarship  
Raytheon Company Scholarships  
Schlage Lock Company Scholarships  
Gregory Stines Memorial Scholarship  
Society of Manufacturing Engineers—  
Student Chapter Scholarships  
Ed Thompson Memorial Scholarship  
Charles Wiswell Scholarship

## LIBERAL ARTS

John Bayliss Broadcast Scholarship  
Central Coast Advertising Club  
Evelyn V. Johnson Scholarship

Michael O'Leary Scholarship  
Music Faculty Scholarship  
Willard "Pete" Pederson Scholarship

## PROFESSIONAL STUDIES AND EDUCATION

California PTA Scholarships  
California Retired Teachers Association—  
Laura E. Settle Scholarship  
Child Development Scholarship  
H. S. Crocker-Roland Meyer Memorial  
Scholarship  
Edward Ernatt—Special Education  
Scholarship

Elizabeth Hanlon Parks Memorial  
Scholarship  
Industrial Technology Society  
Scholarship  
Morro Bay Womans' Club Scholarship  
Napp Systems Scholarship  
Larry Ratner Scholarship  
Mildred Shepard Scholarship

## SCIENCE AND MATHEMATICS

Arthur Andersen and Company—Kappa Mu  
Epsilon Scholarship  
Applegarth Biology Scholarships  
Beta Beta Beta Biological Society  
Scholarships  
Biological Sciences Scholarships  
Chevron, USA, Inc.—Standard Oil  
Company Scholarship  
Dr. Clyde P. Fisher Memorial Scholarship  
Hatfield Memorial Scholarship  
Robert E. Holmquist Memorial Scholarship  
John David Jackman Memorial Award  
W. Boyd Judd Scholarship

E. H. "Woody" Lehman Memorial—  
Natural History Scholarship  
Barbara Lee Lincoln Memorial Award  
Marine Biology Award  
Margaret McCormack Memorial Scholarship  
Microbiology Scholarship  
Mu Delta Phi Scholarship  
Sierra Vista Hospital Volunteers Auxiliary  
Scholarship  
Mary E. Smith Memorial Marine Biology  
Award  
Keith Steele Memorial Scholarship  
Harold J. Watson Memorial Scholarship

## ATHLETICS

The Mickie Burris Award  
Charles Daum Memorial Scholarship

Robert A. Moti Scholarship  
Musselman Wrestling Scholarships

## OTHER SCHOLARSHIPS

In addition to the scholarships awarded by the University, many awards from various private donors and organizations are available to assist students in meeting University expenses. Interested students should make inquiries for such awards directly to the sponsoring organization.

## LOANS

Loans are for educational purposes only, with definite provisions for repayment. There are four types: National Direct Student Loan, California Loans to Assist Students, Guaranteed Student Loans, and Cal Poly Long-Term Emergency Loans. Also available are emergency loans of small amounts, interest free, over a short-term period.

### National Direct Student Loan (NDSL)

The National Direct Student Loan can provide up to \$3,000 per year with a maximum of \$6,000 aggregate to undergraduate students. Loans also are available to graduate students. The NDSL is a five percent interest loan. Repayment begins six months after the student leaves school or ceases to be at least a one-half time student. The government pays the interest while the student is in school and during the six-month grace period. There are a few cancellation provisions for students who teach in a Head Start program or who teach the handicapped. The application for this loan is the SAAC which must be submitted to CSS by March 1 for the upcoming school year.

## California Loans to Assist Students (CLAS)

This program enables parent and student borrowers to obtain loans for educational costs through banks and other lending institutions. A CLAS loan goes into repayment 60 days after the loan is made. Parents and less than full-time student borrowers must pay the interest and principal. Full-time student borrowers begin interest-only payments and may defer principal repayment until a change in enrollment status. CLAS loan interest is currently at 12 percent. To apply, contact your local lending institution or the Financial Aid Office.

## Guaranteed Student Loans (GSL)

This program enables students to borrow funds from banks and other lending institutions. Loans are processed by the university and approved by a cooperating lending agency. The GSL is an eight percent interest loan. The federal government will pay the interest on the principal borrowed while the student is in school. Upon entering the repayment period, the student will assume the interest obligation at eight percent per year on the unpaid balance. Deadlines vary according to the lending agency as do maximum amounts loaned.

## University Emergency Student Loans

University emergency student loan funds are available to provide temporary assistance to eligible students. Loans from these funds are made for varying periods of time and amounts, according to the regulations and conditions prescribed in the establishment of the particular loan fund. The following types of loans may be made by obtaining applications from the Financial Aid Office:

*University Long-Term Emergency Loans* are granted to students who demonstrate a long-term educational need. They are approved by a standing loan committee on the basis of written applications, recommendations, and interviews. Promissory notes signed by the borrower and a cosigner are required. A four to six percent interest is charged on the unpaid balance after the specified due date, graduation, or withdrawal from the university as agreed upon by the borrower. A one percent service charge is deducted from the loan disbursement.

*University Short-Term Emergency Loans* are granted for unexpected emergency situations. A maximum of \$200 may be borrowed during an academic year. Repayment is due either in January or June depending on when the loan was received. A one percent service charge is deducted from the loan disbursement and 12 percent interest is charged on the unpaid balance.

University Emergency Student Loans include donations received from the following:

Agricultural Engineering Loan Fund  
Alumni Loan Fund  
American Society of Heating, and Air  
Conditioning Loan Fund  
American Welding Society Loan Fund  
Lamar Anderson Memorial Loan Fund  
Student Architect Wives' Club Loan  
Fund  
Marie Van Aspersen Memorial Loan Fund  
Bachino Loan Fund  
Baer-Beck Loan Fund  
Edgar E. Bilodeau Loan Fund  
Jed S. Blake Memorial Loan Fund  
CFFA/Agricultural Education Loan Fund  
California Association of Agriculture  
Laboratories Loan Fund  
California Association of Resource  
Conservation Districts Loan Fund  
California Polytechnic State University  
Women's Club Fund  
California Retired Teachers' Association  
Loan Fund

W. B. Camp Loan Fund  
C.A.R.S.E.S. Loan Fund  
Logan S. Carter Loan Fund  
Margaret Chase Memorial Loan Fund  
Herbert E. Collins Loan Fund  
Thomas J. Comer Memorial Loan Fund  
Cooperative Education Loan Fund  
Harlan Diedrichsen Memorial Loan Fund  
Esther Biaggini Dugan Loan Fund  
Environmental Protection Agency Loan  
Fund  
1960 Football Team Memorial Loan Fund  
Independent Order of Foresters Loan Fund  
Anita M. Hathaway Loan Fund  
John Holley Memorial Loan Fund  
Ralph Hoover Loan Fund  
Horsehoeing and Animal Husbandry  
Loan Fund  
Impact Publishers Loan Fund  
International Students Loan Fund

Chris Jespersen Loan Fund  
 Fred Kimball Loan Fund  
 William Kirkpatrick Memorial Loan Fund  
 Alfred M. Kretzmann, Jr., Memorial Loan Fund  
 Lee Gird Levering Memorial Loan Fund  
 Lynn T. Lobaugh Memorial Loan Fund  
 Metal Heat Treating Association of California Loan Fund  
 Music Club Memorial Loan Fund  
 Nissen Educational Loan Fund

Ornamental Horticulture Loan Fund  
 Janet Penfold Memorial Loan Fund  
 Rotary Loan Fund  
 San Fernando Valley Club of Printing House Craftsmen Loan Fund  
 George Schlmeyer Memorial Loan Fund  
 Sears Roebuck Loan Fund  
 Norma Sullivan Memorial Loan Fund  
 Telegram-Tribune Loan Fund  
 Todd Farm Loan Fund

## GRANTS

### Pell Grant

This is a Federal aid program designed to provide financial assistance to undergraduates who need it to attend post-high school education institutions. The amount a student is eligible for depends on their Student Aid Index, full-time or part-time status, and the cost of education. If a student is applying for other aid through the SAAC, they can apply for the Pell grant at the same time. However, students applying for a *Pell only* must complete the Application for Federal Student Aid.

### Supplemental Educational Opportunity Grant Program

This grant-in-aid program is intended to assist undergraduate students who, without substantial aid such as this, could not attend college. Applicants must submit a Student Aid Application for California to the College Scholarship Service by March 1 for the upcoming school year.

### College Work-Study Program

Work-Study is a federally funded program which provides employment for students who are in need of financial assistance in order to complete their education. Jobs can be located on campus as well as at off-campus approved agencies. It is intended that work-study jobs not only assist the student financially but also provide pertinent work experience. Rates of pay vary depending on the job requirements and the student's skills. To apply, complete the SAAC and submit to CSS by March 1 for eligibility consideration for the upcoming school year.

## STATE AID TO THE PHYSICALLY HANDICAPPED

The State of California, through its Bureau of Vocational Rehabilitation, provides financial assistance to students who have physical disabilities. This assistance equals the necessary school expense and may include an additional amount to help cover the cost of living. Students who may be entitled to the assistance should apply to the State Bureau of Vocational Rehabilitation.





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## ACADEMIC REQUIREMENTS AND POLICIES

Curricula leading to graduation with the degree of bachelor of science or bachelor of arts are offered in agriculture, architecture, engineering, business, and in the applied arts and applied sciences. Majors in these fields are described under the appropriate school or division heading in this catalog. In addition, Cal Poly offers the following degrees: master of science, master of arts, master of architecture, master of business administration, master of city and regional planning, master of engineering. It also offers the bachelor of vocational education degree and a technical certificate in selected agricultural fields. Programs leading to teaching credentials authorizing service in the public schools are described under the heading "Teacher Preparation Programs."

### Graduation Requirements

All candidates for a bachelor's degree shall have completed the requirements in one of the listed curricula with a minimum "C" grade average for all units in the major, and shall have earned a total number of grade points at least equal to twice the number of units attempted. For this purpose courses comprising the major are identified on curriculum evaluation sheets available from the Evaluations Office. Transfer students, in their work taken at this university, must earn a number of grade points at least equal to twice the number of units attempted.

All candidates for bachelor's degrees shall have earned not less than 50 quarter units in residence, and shall have earned at least 30 of these units among the last 40 units counted toward the degree. Thirty-six of these units shall be earned in upper division courses and 18 of the units shall be in the major. (Title 5, Section 40403.) Extension credit or credit by examination may not be used to fulfill the residence requirement.

Candidates for the bachelor of science degree (except in engineering) must present from 186 to 198 units for graduation and candidates in engineering must present from 200 to 210 units for graduation according to the approved curriculum for each major. Candidates for the bachelor of arts degree must present 186 units for graduation according to the approved curriculum for each major.

Exemption from required courses by waiver, substitution, or examination does not reduce the total required units for each degree.

### CHOICE OF CATALOG:

#### *Revision of Curricular Requirements*

An undergraduate student remaining in attendance in regular sessions at any California State University campus, at any California community college, or any combination of California community colleges and campuses of the The California State University, may for purposes of meeting graduation requirements, elect to met the requirements in effect at the campus from which the student will graduate either:

- (1) at the time the student began such attendance, or
- (2) at the time of entrance to the campus, or
- (3) at the time of graduation.

Campus authorities may authorize or require substitutions for discontinued courses. A campus may require a student changing his or her major or any minor field of study to complete the major or minor requirements in effect at the time of the change.

For purposes of this section, "attendance" means attendance in at least one semester or two quarters each calendar year. Absence due to an approved educational leave or for attendance at another accredited institution of higher learning shall not be considered an interruption in attendance, if the absence does not exceed two years. (Title 5 of the *California Administrative Code*, Section 40401.)

## DOUBLE MAJORS

The student will normally meet graduation requirements for a degree in one of the major curricula.

It is permissible for a student to be granted a bachelor's degree with two majors if the complete requirements of both major curricula are satisfied at the same time.

No more than one diploma or degree will be granted to the same student at one commencement. In the event that a student has completed the requirements for two different degrees, such as a B.A. and a B.S., the student will be required to declare one major as the degree major in order to determine which degree will be awarded.

A student who desires to submit only one senior project covering two graduation majors must file a petition for special consideration prior to the date of commencing the senior project.

## SECOND BACHELOR'S DEGREE

A qualified student who holds a bachelor's degree from Cal Poly or from another accredited institution may be awarded a second bachelor's degree in a different major. Students must complete General Education and Breadth requirements in effect at the time of admission to the additional baccalaureate degree program and all of the courses for the new degree as specified by the department. A minimum of 45 units of course work for Cal Poly graduates and 50 units for graduates from another accredited institution must be completed in residence after the requirements for the first degree have been fulfilled. A senior project is required for each bachelor's degree.

## MINORS

A minor is not required for graduation but may be used to complement the program of study. A minor is a formal aggregate of classes in a specific subject designed to give a student documented competency in a secondary course of study. In contrast to options and concentrations, the minor stands alone and is distinct from and outside the student's degree major. It is intended that the minor will be completed along with the requirements for the bachelor's degree. Units used to satisfy the degree major requirements may not be applied to a minor. Selection of a major and a minor from the same discipline is not permitted.

The minor offers an integrated and coherent pattern of course work, with at least half of the units at the 300-400 level. A minor consists of 24 to 30 units; a minimum of one-half the required course work toward a minor must be completed in residence. Courses in the minor may not be counted toward the major, but may be used to satisfy support and general education requirements.

A minimum overall grade point average of 2.0 is required in all units counted for completion of the minor. Two-thirds of all units counted in the minor must be in courses graded A to F except for those courses which are graded on a mandatory Credit/No Credit basis.

Students who wish to complete a minor are to contact the department offering the academic minor as early as possible in the program and fill out the appropriate agreement form.

The student indicates the minor at the time he/she requests a graduation evaluation in the Evaluations Office. The completion of the minor will be noted on the student's Permanent Record Card but will not be shown on the diploma. In no case will a diploma be awarded for the minor.

Please refer to "Academic Programs," page 37, for a listing of minors offered at Cal Poly. Information on the curriculum requirements may be found in this catalog under the listing for the department offering the minor.

## GRADUATION WRITING REQUIREMENT

The Board of Trustees of The California State University has mandated that all students earning undergraduate or graduate degrees in the CSU must be certified as proficient in writing at the upper-division level. At Cal Poly students may meet the Graduation Writing Requirement through one of three options:

1. Pass the Junior Writing Test.
2. Pass an approved 300-level composition course with a grade of "C" or better AND receive certification of proficiency in writing from the instructor based on a 500-word in-class essay.
3. Pass an approved 300-level literature course with a grade of "C" or better AND receive certification of proficiency in writing from the instructor based on a 500-word in-class essay.

The following courses may be taken to fulfill the Graduation Writing Requirement:

ENGL 302	ENGL 331	ENGL 340	ENGL 352
ENGL 310	ENGL 332	ENGL 341	ENGL 370
ENGL 318	ENGL 333	ENGL 342	ENGL 380
ENGL 326	ENGL 334	ENGL 350	ENGL 392
ENGL 330	ENGL 339	ENGL 351	

Students must earn proficiency after reaching 90 units. Each student should review his or her curricular requirements to determine which option is appropriate. Students will be eligible for the Junior Writing Test for three quarters after earning 90 units, and those who need additional quarters of eligibility may apply for an extension.

All questions about the Graduation Writing Requirement should be directed to the Writing Skills Program Office, Faculty Office Building 26-H, 546-2067.

## HONORS

Candidates for bachelor's degrees with an overall grade point average falling within the top ten percent of the students graduating from each school shall be those students awarded "Honors at Graduation."

The three Honors categories are as follows:

- Summa cum laude—the top 1%
- Magna cum laude—the next 3%
- Cum laude—the next 6%

Honors at Graduation is officially calculated at the time the graduate has *completed* graduation requirements.

The "President's Honors List" is compiled at the end of each university year to honor those undergraduate students who have demonstrated consistent achievement, as represented by being named to the "Dean's Honors List" for any three of the four quarters of the university year.

The "Dean's Honors List" is compiled at the end of each quarter to honor undergraduate students who have completed 12 or more letter-graded units during the quarter with a grade point average which places them in the top 15 percent of the students in their school.

## EVALUATION FOR GRADUATION

A student should request a graduation evaluation from the Evaluations Office approximately four quarters prior to the student's anticipated graduation date. The evaluation confirms remaining requirements for graduation and is a formal statement on the expected quarter of graduation. The actual date of graduation will be the end of the quarter when all requirements have been met.

## DIPLOMA REGULATIONS

Students may purchase diplomas at El Corral Bookstore. When all degree requirements have been completed, the Graduation Technicians from the Records Office will place the order with the bookstore for the student's diploma, indicating the appropriate date of graduation. The diploma will be mailed approximately four months after your degree has been awarded. Only diplomas which reflect the actual date of graduation will be issued to students.

## General Requirements

### ACADEMIC OBLIGATIONS

All students are expected to be diligent in the pursuit of their courses of study in order that both they and the State will receive maximum benefit from the educational opportunities provided.

Students are expected to satisfy the academic demands required by their instructors in such ways as they may set forth, in order to satisfy the instructor that they are performing their assignments in a proper manner.

Instructors are expected to give first priority to meeting their scheduled classes and other assigned responsibilities, including keeping regular office hours for student conferences.

An instructor, with the President's approval, may at any time exclude from a course any student guilty of unbecoming or disorderly conduct toward the instructor or the class. The instructor may refer the case of misconduct to the Dean of Students for disciplinary action.

### CHANGES IN CURRICULUM

Students who find that they are preparing for a profession which does not provide the type of education for which they have the greatest aptitude should contact their adviser and the university Counseling Center for advice and assistance in making curriculum changes. Students will be permitted to apply for a change of major curriculum after six weeks in residence. Admission to a new curriculum will depend on the availability of space within the limitations imposed by budget, faculty, and facilities.

Transfer from one curriculum to another does not in any way change a student's scholastic standing.

Transfer from a technical to a degree curriculum may be permitted subject to scholarship requirements and completion of the specified number of units in residence.

Upon transfer from a degree to a technical curriculum, at the campus, a student's record is evaluated in terms of the technical curriculum. Courses completed prior to transfer which are applicable to the required courses in the technical curriculum will be transferred intact. The remaining courses completed prior to transfer must apply as electives up to, but not in excess of, the number of elective units specified in the technical curriculum. In the case of an excess of elective units, the student may choose which units shall apply. For purposes of computing the grade point average for graduation, only those courses transferred as outlined above and those taken subsequent to transfer will be used.

### CLASS ATTENDANCE

Students are expected to be regular in attendance to keep the quality and quantity of work high. Absence from classes is regarded as serious, and work missed is not excused.

An excused absence can be allowed only by the instructor in charge of the class upon consideration of the evidence justifying the absence presented by the student. An excused absence merely gives the individual who missed the class an opportunity to make up the work and is not an excuse from the work required.

### CURRICULUM SUBSTITUTION

Although a curriculum is specified for each major, under certain conditions a student may be permitted some deviation from the established curriculum. Detailed instructions for applying for a curriculum substitution may be obtained from the Records Office.

### GRADUATE COURSES TAKEN BY UNDERGRADUATES

Undergraduates are not permitted to take courses in the 400 or 500 series for graduate credit until they are within 12 quarter units of graduation. Such students may petition for up to 9 units of graduate credit when the courses are not required for the baccalaureate degree and must petition for the credit prior to completion of the course work. Students should verify the applicability of such credit toward their graduate objective.

## HOLDING OF RECORDS

Student records may be placed on a "Hold" status because of financial or other obligations to the university. The "Hold" status authorizes the university to withhold the permission to register, release of transcripts, and other services normally provided to the student. The student's records will be held until the obligation is cleared to the satisfaction of the office or department placing the "Hold."

## MAXIMUM UNIT LOAD

The maximum load for regular students is 20 quarter units of work including audited courses and concurrent work at other colleges; the only exceptions are made with the advance approval of the student's major department head and completion of a petition to carry excess load which is available in major departmental offices. Maximum load requirements may be waived only on presentation of evidence of ability to carry successfully such a group of courses. Maximum load for graduate students is 16 units per quarter.

## TRANSFER TO OTHER COLLEGES

Students who plan to transfer from Cal Poly to another college or university should, at the earliest possible date, request that their transcript of academic record be forwarded by the Records Office. Any evaluation of transcripts presented to another college or university will be made by the new institution in terms of its established policies.

## General Education and Breadth Requirements

General Education and Breadth requirements in the CSU are so designed that, taken with the major depth program and elective units presented by the candidate for the bachelor's degree, they will assure that graduates from the several campuses in the system have made noteworthy progress toward becoming truly educated persons. Particularly, the purpose of the breadth requirements is to provide means whereby graduates:

- a) will have achieved the ability to think clearly and logically, to find and critically examine information, to communicate orally and in writing, and to perform quantitative functions;
- b) will have acquired appreciable knowledge about their own bodies and minds, about how human society has developed and how it functions, about the physical world in which they live, about the other forms with which they share that world, and about the endeavors and legacies of their civilizations; and
- c) will have come to an understanding of the principles, methodologies, value systems, and thought processes employed in human inquiries.

General Education at Cal Poly is so designed that, in addition to the objectives mentioned, graduates will have also achieved at least a rudimentary knowledge and understanding of technology.

At least 12 units of General Education and Breadth courses must be upper division.

All the requirements which follow are to be governed by the following general regulation: *Except where expressly prohibited, courses taken to satisfy General Education and Breadth requirements may also simultaneously satisfy requirements in any other portion of the student's curriculum.*

## Distribution Area A

A minimum of 14 quarter units in communication in the English language, to include both oral communication and written communication, and in critical thinking, to include consideration of common fallacies in reasoning.

All students must complete ENGL 114 before taking Critical Thinking. Expository Writing and Critical Thinking must be completed before taking SPC 201 or SPC 202 or ENGL 215 or ENGL 218.

1. ENGL 114 Writing: Exposition (4)

**GEB A.1.**

2. Select *one*: ENGL 125 Critical Thinking (3)  
PHIL 125 Critical Thinking (3)  
SPC 125 Critical Thinking (3)

**GEB A.2.**

- |   |                 |
|---|-----------------|
| 3. Select one: SPC 201 Public Speaking (3)<br>SPC 202 Principles of Speech (3)                        | <b>GEB A.3.</b> |
| 4. Select one: ENGL 215 Writing: Argumentation (4)<br>ENGL 218 Writing: Argumentation and Reports (4) | <b>GEB A.4.</b> |

## **Distribution Area B**

A minimum of 18 quarter units to include inquiry into the physical universe and its life forms, with some immediate participation in laboratory activity, and into mathematical concepts and quantitative reasoning and their applications.

### **1. Physical and Life Sciences GEB B.1.**

All students must complete a minimum of nine units from the approved list of courses in physical and life sciences, at least one course in each. At least one of the courses selected must include a laboratory.

#### **(a) Physical Sciences GEB B.1.a.**

Courses may be selected as follows:

ASTR Any lower division course

CHEM Any lower division course except 106, 200, 252, 253

GEOL Any course except 321. 206 can be selected if GEOL 201 or 204 have been completed.

PHYS Any lower division course except 100, 134, 137, 200, 206, 207, 256, 257

PSC Any lower division course

Any upper division physical science course (i.e., ASTR, CHEM, GEOL, PHYS or PSC prefix) having one of the above as a prerequisite may also be selected with the exception of "Special Problems" courses, "Selected Topics" courses, "Undergraduate Seminar" courses, "Senior Project" courses, and CHEM 405, 419, 457, 458, 481, 482, all 500 courses; PHYS 405, 407, 408, 409, 416; PSC 424, 436.

#### **(b) Life Sciences GEB B.1.b.**

Courses may be selected as follows:

BACT 221 General Bacteriology (4)

BIO Any lower division course except 100, 253 and 255

BOT Any lower division course except 238

ZOO 131 General Zoology (4)

ZOO 132 General Zoology (4)

Any 300-level life science course (i.e., BACT, BIO, BOT or ZOO prefix) having one of the above as a prerequisite may also be selected with the exception of BIO 321, 342.

### **2. Mathematics and Statistics GEB B.2.**

All students must complete a minimum of two courses in mathematics and statistics, at least one of which must be mathematics.

Students may select from the courses listed below, or any mathematics or statistics courses having one of these as a prerequisite, with the exception of "Special Problems" courses, "Selected Topics" courses, "Undergraduate Seminar" courses, "Senior Project" courses, and MATH 327, 403, 424, 435; STAT 330, 421, 512.

MATH 114 College Algebra (3)

MATH 115 Trigonometry (3)

MATH 118 Pre-Calculus Algebra (4)

MATH 119 Pre-Calculus Trigonometry (3)

MATH 120 College Algebra and Trigonometry (5)

MATH 328 Modern Elementary Mathematics (3)

STAT 211 Elementary Probability and Statistics (3)

STAT 251 Statistical Inference for Management I (3)

STAT 321 Statistical Analysis (3)

## Distribution Area C

A minimum of 18 quarter units among the arts, literature, philosophy and foreign languages.

### 1. Critical Reading

#### GEB C.1.

To increase students' experience in expository writing, GEB C.1. English courses have a composition component of 2500 words. A minimum of three lower division courses in literature and philosophy, at least one course in each, selected from the following:

ENGL 230 Masterworks of British Literature: Through the Eighteenth Century (4)

ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4)

ENGL 240 American Tradition in Literature (4)

ENGL 251 Great Books of World Literature: Classical and Ancient World (3)

ENGL 252 Great Books of World Literature: Middle Ages, Renaissance and Enlightenment (3)

ENGL 253 Great Books of World Literature: Romanticism and the Modern World (3)

PHIL 230 Philosophical Classics (3)

PHIL 231 Philosophical Classics (3)

### 2. Fine and Performing Arts

#### GEB C.2.

A minimum of one lower division course selected from the following:

ART 111 Introduction to Art (4)

ART 112 Survey of Art History (3)

MU 101 Materials of Music—Theory I (3)

MU 204 Appreciation of Music (3)

TH 210 Introduction to Theatre (3)

### 3. Electives in Literature, Philosophy, and the Arts

#### GEB C.3.

Select remaining units from courses listed above or from the following list. At least three units must be at the upper division level. Courses offered by the student's major department cannot be counted in the elective portion of Distribution Area C.

ARCH 317 History of Architecture (2)

ARCH 318 History of Architecture (2)

ARCH 319 History of Architecture (2)

ART 312 Art History—Contemporary Art (4)

ART 314 History of Photography: Images and Processes (4)

ENGL 330 British Literature: Medieval Period (4)

ENGL 331 British Literature: The Renaissance (4)

ENGL 332 British Literature: The Enlightenment (4)

ENGL 333 British Literature: Romanticism (4)

ENGL 334 British Literature: The Victorians (4)

ENGL 339 Introduction to Shakespeare (3)

ENGL 340 American Literature to 1860 (4)

ENGL 341 American Literature: 1860-1914 (4)

ENGL 342 American Literature: 1914 to the Present (4)

ENGL 350 Modern Novel (3)

ENGL 351 Modern Poetry (3)

ENGL 352 Modern Drama (3)

ENGL 370 World Cinema (4)

ENGL 380 Contemporary Literary Ideas (3-4)

FORL 101 Foreign Language (3)

FORL 102 Foreign Language (3)

FORL 103 Foreign Language (3)

FR 101 Elementary French (5)

FR 102 Elementary French (5)

FR 103 Elementary French (5)

FR 201 Intermediate French (3)

FR 202 Intermediate French (3)

FR 203 Intermediate French (3)

FR 305 Readings in French Literature (4)

FR 405 French Literature in English Translation (3)



GER 101 Elementary German (5)  
 GER 102 Elementary German (5)  
 GER 103 Elementary German (5)  
 GER 201 Intermediate German (3)  
 GER 202 Intermediate German (3)  
 GER 203 Intermediate German (3)  
 GER 305 Significant Writers in German (4)  
 GER 405 German Literature in English Translation (3)  
 HUM 320 Future Studies (3)  
 HUM 350 Aesthetics (3)  
 HUM 402 Values and Technology (3)  
 MU 209 Jazz Styles (3)  
 MU 404 History of Music (3)  
 MU 405 History of Music (3)  
 MU 406 History of Music (3)  
 PHIL 305 Judeo-Christian Religions (3)  
 PHIL 306 Asian Religions (3)  
 PHIL 307 Philosophy of Religion (3)  
 PHIL 308 Islamic Religions (3)  
 PHIL 311 History of Greek Philosophy (3)  
 PHIL 312 History of Medieval Philosophy (3)  
 PHIL 313 Continental Philosophy: Montaigne to Leibniz (3)  
 PHIL 314 British Philosophy: Bacon to Mill (3)  
 PHIL 315 German Philosophy: Kant to Nietzsche (3)  
 PHIL 316 Contemporary European Philosophy (3)  
 PHIL 317 Contemporary British and American Philosophy (3)  
 PHIL 321 Philosophy of Science (3)  
 PHIL 331 Ethics (3)  
 PHIL 333 Political Philosophy (3)  
 PHIL 335 Social Ethics (3)  
 PHIL 337 Professional Ethics (3)  
 PHIL 341 Philosophy of Art (3)  
 SPAN 101 Elementary Spanish (5)  
 SPAN 102 Elementary Spanish (5)  
 SPAN 103 Elementary Spanish (5)  
 SPAN 201 Intermediate Spanish (3)  
 SPAN 202 Intermediate Spanish (3)  
 SPAN 203 Intermediate Spanish (3)  
 SPAN 305 Significant Writers in Spanish (4)  
 SPAN 405 Hispanic Literature in English Translation (3)  
 SPC 330 Classical Rhetorical Theory (4)  
 TH 327 Theatre History and Literature (3)  
 TH 328 Theatre History and Literature (3)

## Distribution Area D

A minimum of 18 quarter units dealing with human social, political, and economic institutions and behavior and their historical background.

1. *Title 5, Section 40404 Requirements:* **GEB D.1.**
  - HIST 204 The History of American Ideals and Institutions (3)
  - POLS 210 American and California Government (3)
2. HIST 315 Modern World History (3) **GEB D.2.**
3. Select at least *one* course: **GEB D.3.**
  - ECON 201 Survey of Economics (3)
  - ECON 211 Principles of Economics (3)
  - ECON 222 Macroeconomics (4)
4. Select at least *one* course from each group:
  - Group a:** **GEB D.4.a.**
    - ANT 201 Cultural Anthropology (3)
    - GEOG 150 Human Geography (3)
    - SOC 105 Introduction to Sociology (3)

**Group b:****GEB D.4.b.**

Courses offered by the student's major department cannot be counted as satisfying the requirements of this group

- ANT 360 Human Cultural Adaptation (3)
- BUS 404 Governmental and Social Influences on Business (4)
- ECON 304 Comparative Economic Systems (3)
- ECON 325 Underdevelopment and Economic Growth (3)
- GEOG 308 Global Geography (3)
- POLS 370 Contemporary Global Political Issues (3)
- POLS 371 World Food Politics (3)
- SOC 309 World Social System and Its Problems (3)
- SOC 315 Race Relations (3)

**Distribution Area E**

A minimum of 5 quarter units in study designed to equip human beings for lifelong understanding and development of themselves as integrated physiological, social, and psychological entities. Students selecting BIO 220 may count 2 units in Area B and 2 units in Area E.

1. Select *one*: PSY 201 General Psychology (3) **GEB E.1.**  
PSY 202 General Psychology (3)
2. Select *one*: BIO 220 Physiology and Biological Adaptation (4) **GEB E.2.**  
DFA 210 Nutrition (3)  
HE 210 Nutrition (3)  
PE 250 Health Education (2)  
PSY 304 Physiological Psychology (3)  
REC 100 Leisure Education and Lifestyle Management (2)

**Distribution Area F**

A minimum of 6 quarter units in courses designed to acquaint students with an awareness of how technology influences and is influenced by today's world.

1. **Computer Literacy** **GEB F.1.**  
At least one course in computer literacy. This requirement may be met by taking any course bearing a CSC prefix; or AM 250, ENGR 251, or EDES 250. "Special Problems" courses, "Selected Topics" courses, "Undergraduate Seminar" courses, and "Senior Project" courses may not be used to satisfy this requirement.
2. Select at least *one* course from the following: **GEB F.2.**  
AE 340 Irrigation Water Management (3)  
AERO 102 Introduction to General Aviation (3)  
AG 301 Agriculture and American Life (3)  
ARCH 312 Home and Community Design (3)  
ASCI 202 Feeds and Feeding (5)  
ASCI 230 General Animal Science (4)  
CE 221 Transportation Engineering (4)  
CRP 211 Introduction to Urbanization (3)  
CRP 212 Introduction to Urban Planning (3)  
CRSC 230 General Field Crops (4)  
DH 230 General Dairy Husbandry (4)  
DM 230 General Dairy Manufacturing (4)  
ENGR 301 Technology in the 20th Century (3)  
ENVE 324 Introduction to Air Pollution (3)  
ENVE 330 Environmental Quality Control (3)  
FDSC 230 Elements of Food Processing (4)  
FRSC 230 California Fruit Growing (4)  
IT 125 Industrial Wood Processes (3)  
IT 130 Automotive Fundamentals (2)

- IT 141 Plastics Processes and Applications (1)
- IT 233 Metal Technology (3)
- LA 201 Introduction to Landscape Architecture (2)
- LA 213 Site and Terrain Analysis (3-4)
- LA 311 History of Landscape Architecture (3)
- LA 321 Concepts in Environmental Decision Making (3)
- ME 221 Solar Energy (3)
- NRM 101 Natural Resources of America (3)
- NRM 201 Environmental Management (3)
- OH 230 Ornamental Gardening (3)
- PI 121 Poultry Industry Development (4)
- PI 222 Poultry Products, Processing and Marketing (3)
- PI 230 General Poultry Production (3)
- PI 305 Game Bird Propagation and Management (3)
- PI 306 Game Bird Propagation and Management Laboratory (1)
- SS 121 Soils (4)
- VGSC 230 General Vegetable Crops (4)

Students in the Schools of Agriculture, Architecture and Environmental Design, and Engineering and the Department of Industrial Technology are exempt from the requirements of this section (F.2). They may apply a maximum of 3 units from their major toward the satisfaction of the 12-unit upper division General Education requirement.

## Grading System

The following marking and grading system is in effect:

		Grade Points Earned Per Unit	Progress Points Earned per Unit
A	Superior Attainment of Course Objectives .....	4	4
B	Good Attainment of Course Objectives .....	3	3
C	Acceptable Attainment of Course Objectives .....	2	2
D *	Poor Attainment of Course Objectives .....	1	1
F	Non-Attainment of Course Objectives .....	0	0
CR	Credit .....	-	2
NC	No Credit .....	-	0
AU	Audit .....	-	-
I	Incomplete (authorized) .....	-	-
U	Incomplete (unauthorized) .....	0	0
SP	Satisfactory Progress .....	-	-
RD	Report Delayed .....	-	-
W	Withdrew .....	-	-

Final grades signifying student accomplishment are assigned for each course by the instructor. These grades are A,B,C,D,F,U,CR, and NC. A grade point average for each student is computed by dividing the total grade points earned by the total units in which the student received a grade of A,B,C,D,U, or F. Courses for which CR, NC, AU, I, RD, SP, or W were assigned are not included in the grade point computation.

### Progress Points

A system of progress points is used in conjunction with the grade point computation. This measures academic progress for the current quarter, including receipt of CR/NC grades.

\* If a letter grade of "D" is received in a course which is a prerequisite for another course, the student is encouraged to repeat the prerequisite course before attempting the next course in sequence.

A student not receiving twice as many progress points as total units attempted in a given quarter is subject to academic probation or disqualification. Progress point determinations are not cumulative as they are reported only for the current and immediately preceding quarters. A student will be removed from the progress point probation and be restored to satisfactory progress standing the quarter in which twice as many progress points as units are earned.

## **AUDIT**

The "AU" symbol indicates that a student was officially enrolled in class, participated in class, but was not required to be examined on course materials. Enrollment as an Auditor is subject to the permission of the instructor. Procedures for auditing courses are published in the quarterly *Class Schedule*.

An auditor is a student who is attending courses for no credit. The student must be registered with fees paid for the quarter in which the course is to be audited. A student may enroll to audit a course during the add/drop period and no later than the last day to add a course. A student may change from credit to audit no later than the last day to drop a course.

In cases where class sections must be limited in enrollment, preference will be given to students enrolling for credit. Students may not enroll for audit classes at registration.

The student services fee and nonresident tuition fee are determined on the basis of the total units for which the student is enrolled including courses audited.

## **INCOMPLETE (Authorized)**

An incomplete signifies that a portion of required course work has not been completed and evaluated in the prescribed time period due to fully justified reasons and that there is still a possibility of earning credit. It is the student's responsibility to bring pertinent information to the instructor who will determine the means by which the remaining course requirements will be satisfied. A final grade is assigned when the work agreed upon has been completed and evaluated. The student is not permitted to reenroll in the course as a means to complete course requirements.

An "I" must be made up within one calendar year immediately following the end of the term in which it was assigned. An instructor may specify a time limitation of less than one year. This limitation prevails whether or not the student maintains continuous enrollment. Failure to complete the assigned work will result in an "I" being counted as equivalent to an "F" (or an "NC") for grade point average and progress point computation.

## **INCOMPLETE (Unauthorized)**

The symbol "U" indicates that an enrolled student did not withdraw from the course but failed to complete course requirements. It is used when, in the opinion of the instructor, completed assignments or course activities or both were insufficient to make normal evaluation of academic performance possible. For purposes of grade point average and progress point computation this symbol is equivalent to an "F".

## **SATISFACTORY PROGRESS**

The "SP" symbol is used in connection with courses that extend beyond one academic term. It indicates that work is in progress and has been evaluated and found to be satisfactory to date, but that assignment of a grade must await completion of additional work. Reenrollment is permitted prior to the assignment of the final grade provided that the total permissible number of units for the course or courses is not exceeded. Work is to be completed within a stipulated time period. The "SP" symbol shall be replaced with the appropriate final grade within one year except for graduate degree theses for which the time may be up to two years, but may not exceed the overall time limit for completion of all master's degree requirements. Failure to complete the assigned work will result in an "SP" being counted as equivalent to an "F" for grade point average and progress point computation. Any extension of time limit must receive prior authorization by the dean of the school in which the student is a degree candidate.

## CREDIT/NO CREDIT GRADING

Some courses, *as indicated in their catalog descriptions*, are offered on a Credit/No Credit grading basis only.

The following conditions apply when a student *elects* to take for Credit/No Credit grading those courses which are *not* designated by the university as being graded on an exclusive Credit/No Credit basis.

- a. Up to 2 courses (not to exceed 8 units) may be taken per student per quarter on a Credit/No Credit grading basis; a maximum total of 15 courses (not to exceed 45 units) may be elected per student for Credit/No Credit grading.
- b. The course may not be repeated as Credit/No Credit if the student has previously received a grade of "D", "U" or "F" in that course. The course may be repeated for Credit/No Credit only if the student has previously received a grade of "NC" in that course.
- c. Students desiring to elect a course on a Credit/No Credit grading basis must be currently enrolled in the course and must complete the appropriate form available from the Records Office. Such declaration for Credit/No Credit grading must be filed not later than the end of the third week of instruction of the quarter. Students may not change from one grading system to the other after the end of the third week of instruction of the quarter.
- d. Students will be given a grade of "Credit" for accomplishment equivalent to a grade of "C" or better. "No Credit" will be given for accomplishment equivalent to "D" or "F" grades. Instructors will submit conventional letter grades to the Registrar's Office where they will be converted to Credit/No Credit grades.
- e. Courses required for the student's major which are specified as either major or support courses in the student's major curriculum may not be taken for Credit/No Credit grading with the exception of those courses offered on a Credit/No Credit basis only, and those taken as Credit/No Credit under a previous major.
- f. The applicant for a Credit/No Credit grade must have at least a 2.0 grade point average in cumulative Cal Poly work.
- g. Units earned in courses for which the grade was "Credit" will count toward satisfaction of degree requirements for undergraduate students only. No courses taken on a Credit/No Credit grading basis may be used to satisfy graduate program degree requirements.
- h. Grades of "Credit" or "No Credit" are not included in determining the student's grade point average.
- i. Nonmatriculated students in the Extension Program, Summer Session, and Workshops must meet the same requirements as matriculated students to elect courses on a Credit/No Credit grading basis. (The 2.0 GPA requirement is waived in the case of nonmatriculated students having no previous course work recorded at Cal Poly.)

## REPEATING A COURSE

Students may enroll in a course for credit more than once only if the catalog course description states that the course may be repeated for credit. An exception to the policy allows the repeating of a course for credit or for improving the grade point average under the following conditions:

1. A course taken at this or at another university or college in which a grade of "D," "F," or "U" was received may be repeated here with the new grade recorded along with the prior grade. The grade earned by repeating the course will be awarded the appropriate progress points, grade points and units attempted and completed. An original "NC" grade may be repeated for CR/NC or a letter grade, but not for improving grade point averages.
2. Undergraduate students may repeat up to 20 units of "D," "F," or "U" and the original grade points and units will not be counted in the calculation of the grade point average. However, under the terms of this rule, a notice of intent to repeat a course must be filed in the Records Office prior to the end of the seventh week of instruction during the quarter in which the course is repeated.
3. Except where noted in the specific course description that the course may be repeated for credit, a student may not enroll in (except as an auditor) or receive credit by examination for any course in which a grade of "C" or higher, including "CR" has been received. A student may not petition for credit by examination during the same quarter that the student is enrolled in the course.

## **WITHDRAWALS FROM COURSES**

The "W" symbol indicates that the student was permitted to withdraw from the course after the regular add/drop (change of program) period with the approval of the instructor and appropriate campus officials. It carries no adverse connotation of quality of student performance and is not used in calculating grade point average or progress points.

Between the end of the regular add/drop period and the last day of instruction a student must request permission to withdraw from a course by processing a petition which is available at the Records Office. The petition will be approved and withdrawal authorized only if there are serious and compelling reasons for withdrawal in the judgment of the instructor and department head.

After the end of the 7th week of instruction withdrawals are permitted only if the withdrawal is based on an emergency situation clearly beyond the control of the student. In some such cases a final or incomplete grade may be assigned for courses in which sufficient work has been completed to permit an evaluation to be made. The student must request permission to withdraw as specified above, or request grade assignment, both of which are subject to approval by designated campus officials. Any student who fails to provide notification or who fails to obtain formal approval to withdraw will be subject to failing grades (U or F).

## **WITHDRAWAL FOR THE QUARTER**

A student is permitted to withdraw from all classes for the quarter upon request and without restriction or penalty until the end of the 7th week of instruction. After the 7th week and through the last day of instruction, withdrawals for the quarter must be approved by campus officials. Disapproved, unauthorized, or unofficial withdrawal will subject the student to failing grades in all classes (U or F).

The student or duly authorized representative of the student is required to submit the request and reason for withdrawal in writing to the Registrar. The date of withdrawal will be established as the circumstances indicate or as determined by the Registrar.

The student may be eligible for a full or partial refund of registration fees depending upon the time and circumstances of withdrawal. A written application for refund is required. Specific limiting dates and application procedures are published in the quarterly *Class Schedule*.

## **Registration**

All students are required to enroll in courses which meet the requirements of their major course of study insofar as these courses are available.

The schedule for registration and payment of fees is published in the *Class Schedule* which is on sale prior at the start of each quarter. Students should consult this booklet for detailed registration procedures.

Credit for course work completed is given only when the student is properly registered. A student is not properly registered until fees have been paid and quarterly registration materials have been filed with the Registrar's Office. Individuals are not permitted to attend courses unless they are officially registered as regular students, as approved extension students, or as enrolled auditors (see "Audit").

## **ADD/DROP (Change of Program)**

An official study list is prepared for each student who completes the formal registration process and is sent to the student's major department. All changes to the official program become the responsibility of the student. An add/drop (change of program) period occurs during the first two weeks of instruction of each quarter during which students have the opportunity to add new classes or voluntarily drop from existing classes. Specific dates for completing these transactions are published in the quarterly *Class Schedule*. The student must ensure that each instructor is properly notified before the expiration of the time limits and that the instructor formally acknowledges the change to the student's official program. A revised study list will be prepared for each student which will list the courses in which a final grade will be awarded.

Students registering late have approximately two weeks to complete the late registration process and pay late registration fees. The deadline date for late registration is published in the quarterly *Class Schedule*.

Students have until the end of the second week of instruction to drop a class without petition and no entry will be made on their academic record. At the end of the first class meeting only, the instructor may delete a student's name from the official class list if the student is not present or has not been excused. It is the student's responsibility to notify the instructor whenever a class is dropped and it should not be assumed that voluntary absence from class means automatic withdrawal. At the end of the regular add/drop period the instructor must assume that any student who has not provided notification of withdrawal remains officially enrolled in the course. For program changes after the end of the regular add/drop (change of program) period see "Withdrawals from Courses."

A special provision, applicable only to students in their first quarter at the university, permits the substitution, without prejudice, of a prerequisite course in a sequence of courses for a later course in the sequence through the end of the fourth week. Only the substituted course appears on the transcript and the grade is based on performance after the change.



## Scholarship Requirements

Uniform standards for academic probation or disqualification, and for administrative-academic probation or disqualification, are in effect at all campuses of The California State University. Undergraduate students may be placed on academic probation and later be disqualified, or be placed on administrative-academic probation and later be disqualified, when they do not meet these standards.

Students who have been placed on academic probation, administrative-academic probation, or who have been notified of their disqualification may request review of such action by the dean of the school taking the action. Students who have been disqualified for inadequate progress or performance will not be readmitted until presentation of satisfactory evidence that they have improved their chances of academic success. The request for readmission will be referred to the dean of the school in which the student wishes to enroll.

Students on academic probation may not participate on intercollegiate teams nor may they hold positions of leadership in student organizations or student government groups. This includes, but is not limited to, such groups as: athletic teams, debate teams, drama casts, judging teams, ASI councils, boards and committees. Such students may not hold an office in a student organization, nor may they be editors, managers, or hold similar positions on student publications. However, students on academic probation may participate in such activities as club membership, intramurals, and music which do not include travel and the official representation of the university.

Certain groups may have set higher standards than the minimum for specific positions or areas of responsibility that require considerable commitments of time and energy.

## ACADEMIC PROBATION OR DISQUALIFICATION

Both academic progress toward the degree objective and quality of academic performance are considered in the determination of a student's eligibility to remain enrolled. An undergraduate student becomes subject to academic probation or disqualification under the conditions shown below. For minimum scholarship standards applicable to graduate and postbaccalaureate students see the Graduate Studies section, page 117.

- I. Academic Probation: An undergraduate student is subject to academic probation if at any time his or her cumulative grade point average in all college work attempted or the student's Cal Poly cumulative grade point average falls below 2.0 (C) *or* if during any term while enrolled he or she fails to earn at least two times as many progress points as all units attempted. Students are notified of probationary status by a message on their grade report. An undergraduate student will be removed from academic probation when the student's cumulative grade point average in all college work attempted and the student's Cal Poly cumulative grade point average is 2.0 (C) or higher *and* when he or she earns at least twice as many progress points as all units attempted in a term.
- II. Academic Disqualification: An undergraduate student on academic probation *may* be disqualified when his or her cumulative grade point average for all college work attempted or his or her Cal Poly cumulative grade point average is 7 or more grade points below 2.0 (C), or, regardless of class level or cumulative grade point average, when in any term he or she fails to earn at least twice as many progress points as units attempted. Such a student on academic probation *shall* be subject to disqualification:
  - A. As a freshman or sophomore student (less than 90 quarter units of college credit completed) whose average falls  $22\frac{1}{2}$  or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.
  - B. As a junior student (90 to 134 quarter units of college credit completed) whose average falls  $13\frac{1}{2}$  or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.
  - C. As a senior student (135 or more quarter units of college credit completed) whose average falls 9 or more grade points below a 2.0 (C) average on all units attempted or in all units attempted at Cal Poly.



A student who is placed on probation or who is subject to disqualification at the end of an enrollment period will be notified by a message on the grade report which is issued following the end of the quarter in which the student's performance fails to meet the prescribed conditions. In cases where a student ordinarily would be disqualified at the end of a term save for the impossibility of making timely notification, the student may be advised that the disqualification is to be effective at the end of the next term.

## **ADMINISTRATIVE-ACADEMIC PROBATION OR DISQUALIFICATION**

An undergraduate or graduate student may be placed on administrative- academic probation by action of the dean of the school in which the student is enrolled for any of the following reasons:

- A. Withdrawal from all or a substantial portion of a program of studies in two successive terms or in any three terms.
- B. Repeated failure to progress toward the stated degree or program objective when such failure appears to be due to circumstances within the control of the student.
- C. Failure to comply, after due notice, with an academic requirement or regulation which is routine for all students or a defined group of students.

When such action is taken, written notice will be provided including a statement of the conditions for removal from probation and the circumstances which would lead to disqualification, should probation not be removed. If disqualified, the student will receive written notification from the dean of the school in which the student is enrolled including an explanation of the basis for the action.

## **ELIBILITY FOR INTERCOLLEGIATE ATHLETICS**

Eligibility for competition in intercollegiate athletics is regulated in general by the rules of the National Collegiate Athletic Association (NCAA), and specifically by current Conference and university regulations. The Director of Athletics is responsible for maintaining up-to-date intercollegiate athletics eligibility rules applicable to the university. The Faculty Athletic Representative has the responsibility for the interpretation of the NCAA, Conference, and university rules for determining student eligibility to represent the university in intercollegiate athletic events.

## **ELIGIBILITY FOR STUDENT ACTIVITIES**

Students on either academic or disciplinary probation may not participate on intercollegiate teams nor may they hold positions of leadership in chartered student organizations or coded student government groups. Students on probation may participate in such student organizations and groups as members but they may not hold an office or represent the university or the Associated Students, Incorporated, in any official capacity.

## **STUDENT GRIEVANCE PROCEDURES**

The university provides grievance procedures for students who feel aggrieved in their relationships with the university, its policies, practices, and procedures or its faculty and staff.

### **The Fairness Board**

The Fairness Board is the campus group primarily concerned with providing "due process" for the students and instructors at the university, particularly in terms of student/faculty relationships. The Board hears grade appeals based on the grievant's belief that the instructor has made a mistake, shown bad faith or incompetence, or been unfair. However, the Fairness Board also may hear cases involving student/administration relationships. In all cases, the Board's authority is limited to actions consistent with other campus and system policies.

Details and procedures relating to the operation of the Fairness Board may be obtained from the *Campus Administrative Manual* located in departmental offices or from the Student Affairs Office.

## **STUDENT CONDUCT AND DISCIPLINE**

It is expected that all Cal Poly students are enrolled for serious educational pursuits and that they will conduct themselves so as to preserve an appropriate atmosphere of learning. It is also expected that all students who enroll at Cal Poly are willing to assume the responsibilities of citizenship in the campus community. Association in such a community is voluntary, and students may withdraw from it at any time that they consider the obligations of membership disproportionate to the benefits. While enrolled, students are subject to campus authority which includes the prerogative of dismissing those whose conduct is inimical to the aims of an institution of higher education.

While enrolled, students are subject to the regulations governing discipline stated in *Education Code* Section 66017 and in Title 5 of the *California Administrative Code*, Sections 41301–41304, and to such rules and regulations as have been approved and promulgated by authority of the President. Copies of Title 5 *Cal Adm Code* 41301 and 41302, which deal specifically with student disciplinary regulations, are available to all students in the "Appendix" of this catalog, through the "Campus Rules" section printed in the *Class Schedule* for each quarter, and are posted officially in the Administration Building. Other applicable regulations are contained in this Catalog, in the *Campus Administrative Manual*, and in other official university publications.

### **STUDENT DISCIPLINARY PROCEDURES**

The Chancellor of The California State University has established procedures for student disciplinary matters which are included in the Campus Administrative Manual, the official campus publication of policies and procedures which is available in the library for easy reference.

Educating students to their responsibilities as good citizens of the university and of the community is a campus-wide responsibility requiring the cooperation and understanding of the entire campus. Title 5 of the *California Administrative Code* assigns to the President responsibility for enforcement of student disciplinary regulations. The President has delegated to the Director of Judicial Affairs the responsibility and commensurate authority to administer student disciplinary regulations and has delegated decision-making authority on cases which proceed to a hearing at the local campus level to the Dean of Students.

When the conduct or behavior of a student is such that there is an alleged violation of applicable provisions of the *Education Code*, regulations of the Board of Trustees, and campus rules and orders issued thereunder, the case is referred to the Director of Judicial Affairs for investigation of the facts leading to the allegation. If the investigation reveals that there is reason to believe that an infraction has been committed by a student, disciplinary procedures as described in the *Campus Administrative Manual* will be initiated.

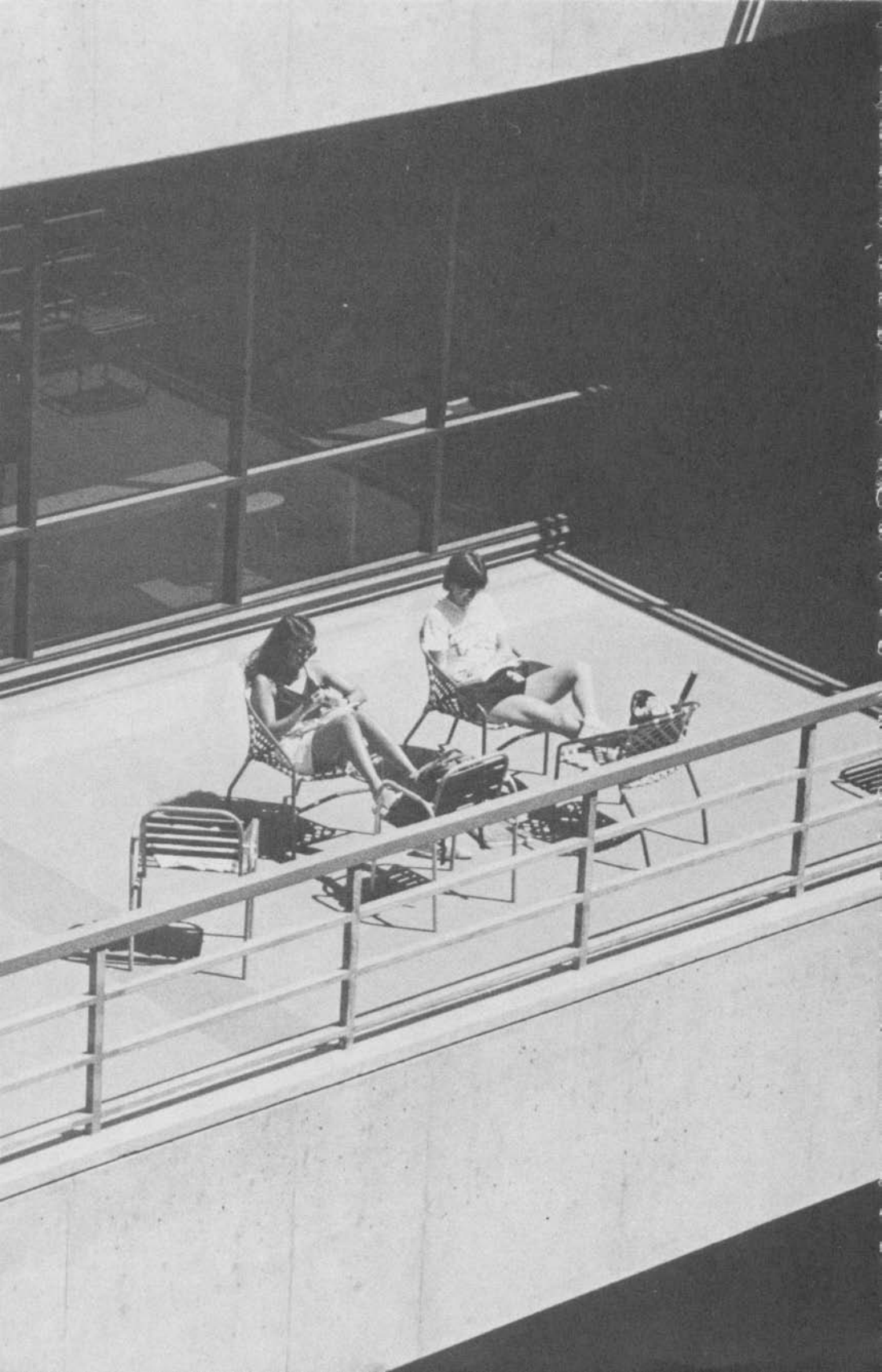
### **Student Involvement in Disciplinary Procedures**

Student Hearing Boards conduct hearings in the residence halls and make recommendations to the Director of Judicial Affairs. In addition, students have majority representation on the Student Appeals and Advisory Commission which also includes members of the faculty and of the administrative staff; this group makes recommendations to the President in appropriate cases.

### **PROCEDURAL DUE PROCESS**

In all matters of student discipline, each person charged with a violation is given every courtesy, privilege, and right under the law and within the context of the uniqueness of a public institution of higher learning.





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# Graduate Studies

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# GRADUATE STUDIES

## Programs

Agriculture, M.S.	Education, M.A.
Architecture, M.Arch.	Engineering, M.Engr.
Biological Sciences, M.S.	English, M.A.
Business Administration, M.B.A.	Home Economics, M.S.
Chemistry, M.S.	Industrial and Technical Studies, M.A.
City and Regional Planning, M.C.R.P.	Mathematics, M.S.
Computer Science, M.S.	Physical Education, M.S.
Counseling, M.S.	

Cal Poly does not operate separate graduate schools, but offers studies leading to advanced degrees through the existing instructional departments. Graduate degrees are based on programs closely coordinated with undergraduate instruction and sharing laboratories and other academic resources. The graduate student has an opportunity to work with all departmental faculty and students and to share in all campus activities.

University policy governing graduate study emphasizes the need for maturity, responsibility and scholarly integrity of the student. Graduate students should have a command of basic knowledge, techniques, and skills essential for independent and self-directed study.

In graduate courses students must cope with more complex ideas, problems, techniques or materials than in undergraduate courses. Graduate study demands searching and exhaustive analysis, identification and investigation of theories and principles; application of theory to new ideas, problems, and materials; extensive use of bibliographic and other resource materials, with emphasis on primary sources for data; and demonstration of competence in scholarly presentation of the results of independent study.

It is the responsibility of the student to ascertain and comply with all university, school and departmental procedures and requirements.

Development of curricula for graduate degrees is provided for in the campus academic master plans, subject to approval by the Chancellor and the Board of Trustees of The California State University.

The university is accredited as a four-year, degree-granting institution by the Western Association of Schools and Colleges. The Architecture program is also individually accredited by The National Architecture Accrediting Board.

## APPLICATION PROCEDURES

### Filing Timelines

Terms in 1986-87	Applications First Accepted	Filing Period Duration	Student Notification Begins
Summer Qtr.	Feb. 1, 1986	Each campus accepts applications until capacities are reached. Most campuses accept applications up to a month prior to the opening day of the term. Some campuses will close individual programs earlier.	March 1986
Fall Qtr.	Nov. 1, 1985		Dec. 1985
Winter Qtr.	June 1, 1986		July 1986
Spring Qtr.	August 1, 1986		Sept. 1986

All applications postmarked or received during the initial filing period will be given equal consideration within established enrollment categories and quotas. There is no advantage in filing before the initial filing period. Applications received before the initial filing period may be returned, causing a delay in processing. Cal Poly will continue to accept applications during the extended filing period until quotas are filled. Application priority within the extended period is granted in chronological order in which applications are received.

## Who Must Apply

All applicants for any type of postbaccalaureate status (i.e., master's degree applicant, those interested in taking courses for personal or professional growth) must file a complete application within the appropriate filing period. A complete application for postbaccalaureate status includes all of the materials required for undergraduate applicants (part A) plus the supplementary graduate admissions application (part B). Postbaccalaureate applicants who completed undergraduate degree requirements and graduated the preceding term are also required to complete and submit an application and the \$35 nonrefundable application fee. Since applicants for postbaccalaureate programs may be limited to the choice of a single campus on each application, redirection to alternative campuses or later changes of campus choice will be minimal. In the event that a postbaccalaureate applicant wishes to be assured of initial consideration by more than one campus, it will be necessary to submit separate applications (including fees) to each. Applications may be obtained from the Admissions Office or Graduate Studies Office of any California State University or at any California high school or community college.

## Residency Status Determination

The campus Admissions Office determines the residence status of all new and returning students for nonresident tuition purposes. Responses to the Application for Admission and, if necessary, other evidence furnished by the student are used in making this determination. A student who fails to submit adequate information to establish a right to classification as a California resident will be classified as a nonresident. A detailed explanation of residence requirements appears on page 80.

## ADMISSION OF POSTBACCALAUREATE AND GRADUATE STUDENTS

### Admission Requirements

Graduate and postbaccalaureate applicants may apply for a degree objective, a credential or certificate objective, or may have no program objective. Depending on the objective, The CSU will consider an application for admission in one of four categories:

- *Postbaccalaureate Unclassified*—you will qualify for admission as an unclassified postbaccalaureate student if you (1) hold an acceptable bachelor's degree from a regionally accredited institution or have equivalent academic preparation as determined by the campus; (2) have a grade point of at least 2.5 in the last 60 semester (90 quarter) units attempted; and, (3) are in good standing at the last college attended. In unusual circumstances, a campus may make exceptions to these criteria.

If eligible in postbaccalaureate unclassified standing, you may qualify for:

- *Postbaccalaureate Classified* standing to enroll in a credential or certificate program provided you satisfy the additional professional, personal, scholastic, and other standards, including qualifying examinations, as the campus may prescribe; or
- *Graduate Conditionally Classified* standing to enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority you can remedy any deficiencies by additional preparation; or
- *Graduate Classified* standing to enroll in a graduate degree curriculum if you satisfactorily meets the professional, personal, scholastic, and other standards, including qualifying examinations, as the campus may prescribe.

## TOEFL Requirement

All graduate and postbaccalaureate applicants, regardless of citizenship, whose preparatory education was principally in a language other than English must demonstrate competence in English. Those who do not possess a bachelor's degree from a postsecondary institution where English is the principal language of instruction must receive a minimum score of 550 on the Test of English as a Foreign Language (TOEFL).

## INTERNATIONAL (FOREIGN) STUDENTS

To be considered for admission from a foreign country, an applicant must meet separate requirements in addition to those listed for American students at the same class level. These requirements are:

- Two official English translations of transcripts covering all high school and college work attempted.
- An official copy of the score on the Test of English as a Foreign Language (TOEFL).
- Certification of financial responsibility.

Application forms must be submitted to the Admissions Office during the appropriate initial filing period. Supporting documents must be submitted early enough to allow for the processing of the application and necessary travel documents.

Various services and assistance for International/Foreign Students on-campus are available through the Dean of Students Office.

## Academic Requirements and Responsibilities

The following are the basic general requirements for all master's degrees:

- Complete a minimum of forty-five quarter units of approved graduate work completed within the seven-year period preceding the date when all the requirements of the degree are completed.
- A student may elect to meet the graduation requirements in effect in the catalog either at the time the student was admitted to graduate standing (conditional or classified) or at the time of graduation. The student may be required to make substitutions for discontinued courses.
- A full-time student is defined as taking more than 8 units in a quarter. Students receiving financial aid may need to meet different requirements to be considered full-time and should consult with the Financial Aid Office.
- In the degree program:
  - (a) No fewer than 32 quarter units shall be completed in residence.
  - (b) No fewer than one-half of the units required for the degree shall be in courses organized primarily for graduate students (500 level).
  - (c) No more than nine quarter units shall be in student teaching.
  - (d) No more than nine quarter units shall be allowed for a thesis, but the requirement of a thesis is optional with the department.
- Maintain a grade point average of 3.0 (grade of B on a scale where A = 4.0), or better, in all units attempted subsequent to admission to the program, as well as all courses in the formal program of study. A course in which no letter grade is assigned shall not be used in computing the grade point average.
- Maintain satisfactory scholarship and professional standards. Only those graduate students who continue to demonstrate a satisfactory level of scholastic competence and fitness, as determined by the appropriate university authorities, shall be eligible to continue in such curricula. Students whose performance is judged to be unsatisfactory by the authorities of the university may be required to withdraw from all graduate degree curricula offered by the university.
- Complete a satisfactory formal program of study in the field of the degree as approved by the student's graduate adviser and committee.



- Complete successfully a culminating experience (thesis, project or comprehensive examination) in order to be granted a graduate degree.
- Take the standardized tests required in the area of the master's degree objective (normally during the first quarter of study), on dates announced by the Testing Center of the university. These must be applied for at designated dates, well in advance of the testing dates, on forms supplied by the department of the master's degree or by the Testing Center. Fees must accompany the form. If the specific tests required in the student's master's degree program have been taken elsewhere, consult with the Testing Center well in advance for transfer of results to the Center, and arrange with the Center for subsequent transfer of test results to the department concerned.

*Within these general requirements there are specific departmental requirements for each specific degree. These will be found in the descriptions of master's degree programs elsewhere in this catalog and in further detail at the school or department offices.*

## Academic Disqualification

A graduate or postbaccalaureate student shall be subject to disqualification if while on probation the student fails to earn sufficient grade points to be removed from probationary status. Disqualification may be either from further registration in the program or from further enrollment at the university as determined by the student's school dean. Notification of disqualification will be made by the school's dean.

## Academic Probation

A student who is enrolled in a graduate degree program in conditionally classified or classified standing shall be placed on academic probation for failure to maintain a cumulative grade point average of at least 3.0 (grade of B on a scale where A = 4.0) in all units attempted subsequent to admission to the program.

A student who has been admitted as postbaccalaureate-classified in order to pursue a single subject credential program shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 2.5 in all units attempted subsequent to admission to postbaccalaureate standing. Please refer to the single subject department for specific requirements. A student pursuing a multiple subject credential program shall maintain a cumulative grade point average of at least 2.8 in all units attempted subsequent to admission to postbaccalaureate standing. A postbaccalaureate classified student in any of the specialist credential programs shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 3.0 in all units attempted subsequent to admission to postbaccalaureate standing.

A postbaccalaureate unclassified student (one who has not been admitted to either a credential or graduate degree program) shall be subject to academic probation for failure to maintain a cumulative grade point average of at least 2.5 in all units attempted subsequent to admission to postbaccalaureate standing.

A student must be placed on probation prior to disqualification. The student's school dean will notify the student of disqualification.

## Advancement to Candidacy

Advancement to candidacy recognizes that the student has demonstrated the ability to operate at and sustain a level of scholarly competence which is satisfactory for successful completion of the degree requirements. The student is then cleared for the final stages of the program which in addition to any remaining course work would include the thesis, project, comprehensive examination, or equivalent.

The student must request Advancement to Candidacy after a formal program of study has been submitted and sufficient course work has been completed to allow the department to make a qualitative judgment, and before registering for the thesis/project or culminating examination, or equivalent. Only students who achieve this status are candidates for the degree.

## **Advisement and Approvals**

The student should ask the department for assignment of an adviser in the area of the desired master's degree program. The basic responsibility for advising master's degree students is with departmental advisers and graduate coordinators, and it is essential that students periodically consult with them. Approval of completion of a master's degree program is made by school or departmental graduate study committees on the recommendation of advisers.

Students should meet with their advisers prior to registration time for information concerning prerequisites, courses to be taken, and to develop an informal study plan and formal program of study. An informal study plan is a projection of initial coursework, including prerequisites, that the student will undertake prior to filing a formal program of study or in lieu of the formal program of study if the student is of postbaccalaureate status.

If a student is conditionally classified, he or she must submit a request for classified graduate status to the departmental adviser early during the first quarter. After the department has approved the request, the adviser will retain the duplicate copy of the form and send the original to the Records Office.

Students are urged to maintain a personal file of transcripts and other records of all undergraduate and graduate work undertaken and make this file available whenever seeking advisement.

## **Credit/No Credit Grading**

Graduate students may elect to take courses which are not part of their formal program of study on a credit/no credit basis subject to the conditions stated in this catalog on page 105. It should be noted that courses taken on a credit/no credit basis may not be used to satisfy graduate program requirements unless they are offered for credit/no credit only.

## **Culminating Experience**

The culminating experience for the granting of a graduate degree is the successful completion of a thesis, project or comprehensive examination. The quality of work accomplished, including the quality of the writing, is the major consideration in judging the acceptability of the thesis, project, or comprehensive examination. The student must successfully complete a culminating experience to be granted a graduate degree.

## **Enrollment in Graduate Courses**

To enroll in graduate courses a student must have postbaccalaureate standing, graduate standing, or permission of the instructor.

## **Extension, Concurrent and Summer Session Courses**

1. No more than 13 quarter units of approved extension courses shall be accepted for the master's degree. Regular extension courses may not be used to satisfy the residence requirement.
2. No more than 12 quarter units of approved concurrent enrollment shall be granted credit if taken prior to the submission of a formal program of study. Concurrent enrollment courses are counted as residence credit.
3. No more than 12 quarter units of summer session shall be granted credit if taken prior to the submission of a formal program of study. Summer session courses are counted as residence credit.

## **Formal Program of Study Requirements**

The student should make an appointment with the adviser before the 12th unit of work is completed to develop the formal program of study for the master's degree. A formal program of study is an agreement between the student and school as to the specific coursework to be completed in order to fulfill the requirements of the master's degree. A copy of the formal program of study must be submitted to the Graduate Studies Office. It will be reviewed and forwarded to the Evaluations Office.

A minimum of 32 quarter units for the master's degree must be taken after a formal program of study has been approved by the faculty adviser and filed with the Graduate Studies Office.

## Grade Point Calculation for Graduate Degree

The calculation of the grade point average will include all grades, although only the units in courses in which the student earns grades of A, B, or C will be counted to satisfy the requirements for the degree.

## Graduate Courses Taken by Undergraduates

Undergraduates are not permitted to take courses in the 400 or 500 series for graduate credit until they are within 12 quarter units of graduation. Such students may petition for up to 9 units of graduate credit when the courses are not required for the baccalaureate degree and must petition for the credit prior to completion of the course work. Students should verify the applicability of such credit toward their graduate objective.

## Graduate Degree and Postbaccalaureate (Unclassified) Course Credit

No more than 12 quarter units of approved postbaccalaureate (unclassified) course credit will be accepted for the master's degree.

## Graduation

A student planning to graduate must request a final graduation evaluation from the Evaluations Office approximately two quarters prior to the anticipated date of degree completion. A student cannot graduate without this evaluation.

Those candidates for master's degrees who attain a grade point average which is in the upper ten percent of their major and whose grade point average is 3.75 or better may upon the recommendation of the school dean be designated as "Graduating with Distinction."

Those graduating students wishing to participate in commencement exercises must also make the necessary arrangements for themselves and any guest(s). This is handled through the Educational Services Office.

For information on diploma regulations, see page 96.

## Graduation Writing Requirement

The Board of Trustees of The California State University has mandated that all students earning a graduate degree must be certified as proficient in writing at the upper division level. Unless a major department or school has a specific requirement, students may meet the Graduation Writing Requirement through one of three options:

1. Pass the Junior Writing Test.
2. Pass an approved 300-level composition course with a grade of C or better AND receive certification of proficiency in writing from the instructor based on a 500-word in-class essay.
3. Pass an approved 300-level literature course with a grade of "C" or better AND receive certification of proficiency in writing from the instructor based on a 500-word in-class essay.

According to policy approved by the Provost, all graduate students must attempt to meet the Graduation Writing Requirement in the first quarter of residence. Each student should review his or her curricular requirements to determine which option is appropriate. Questions should be addressed to the Writing Skills Office, Faculty Office Building 26-H, 546-2067.

## Maximum Unit Load

Students normally are not permitted to enroll in more than 16 units each quarter.

## **Prerequisites**

Each master's degree program has specific prerequisites, both in courses and in grade point average. Deficiencies in prerequisites must be removed prior to advancement to classified graduate status, and courses for this purpose normally will not count toward fulfillment of the unit requirement for the degree.

## **Readmission to the University**

Graduate students may take a leave of absence from the university for any one quarter without filing an application for readmission (summer quarter counts as one quarter). After an absence of more than one quarter, students must reapply for admission.

## **Registration**

The schedule for registration and payment of fees is published quarterly in the *Class Schedule* which may be purchased from the El Corral Bookstore prior to each quarter. This booklet includes detailed registration instructions and lists classes offered for each quarter. Descriptions of courses are listed in this catalog.

## **Repeating a Course**

Students may enroll in a course for credit more than once only if the catalog course description states that the course may be repeated for credit. An exception to this policy allows the repeating of a course in cases where a grade of "D" or "F" was received. However, both grades will be reflected in the calculation of the GPA. Graduate students are not eligible to repeat courses and remove the grade points from inclusion in calculation of the GPA.

## **Second Master's Degree**

A student can earn only one master's degree in any of the graduate disciplines offered. A student who wishes to complete a second master's degree in another discipline or two master's degrees simultaneously must complete all the requirements for both degrees. Of the units required for each degree, no more than nine quarter units of course work may be used to satisfy requirements in both master's degree programs.

## **Theses and Project Reports**

When a thesis or project is required in a master's degree program, a committee-approved copy completed in accordance with university specifications must be received and reviewed by the Graduate Studies Office. Upon completion of any required corrections one copy ready for binding is filed with the Graduate Studies Office for submission to the University Library. (Two copies of the thesis or project report will actually be maintained by the Library; one bound and one on microfiche.) These steps must be completed before the degree can be awarded.

The student should consult the latest edition of the "Manual of Instructions for the Preparation and Submission of the Master's Thesis or Master's Project" for guidance in the preparation of a thesis or project. The manual may be obtained from the Academic Programs/Graduate Studies Office.

## **Time Limit Extension**

The university, at its option, may extend the seven-year time frame for students who pass an examination or who have sufficient advanced work in the relevant course or subject field.

## **Undergraduate Courses**

Certain 400 series courses may be completed by the graduate student as part of the degree program when this is consistent with university requirements, departmental master's degree specifications, and the candidate's formal program of study. The student always should consult the adviser to make certain that approved courses are selected since departmental requirements vary and some courses are excluded.





# School of Agriculture

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## SCHOOL OF AGRICULTURE

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Lark P. Carter, Dean

Larry P. Rathbun, Associate Dean

John W. West, Associate Dean

The School of Agriculture prepares students in the field of agriculture with the main objective of giving them a broad and full understanding of basic factors involved in production, management, processing, distribution, marketing, sales, and services in related businesses to make efficient operators and managers. While the school stresses production techniques and basic management to benefit those going into farming or entering employment in other agricultural fields, it also requires a core of basic science courses related to the major and general education courses.

This preparation also provides the sound basis necessary for the student desiring to become a teacher of agriculture in California's secondary schools and community colleges.

Curricula in the School of Agriculture are arranged so that the student receives a maximum of production courses in the major field early in the program. The student who goes to work prior to graduation thus acquires some knowledge and experience which can be applied. In addition, the student is able to determine in a short time whether or not the curriculum selected is appropriate to his or her skills and interests.

Furthermore, the early acquisition by the student of practical, "doing" types of activities provides an incentive to learn basic scientific explanations.

The courses offered in each agricultural curriculum may be grouped into four areas as follows:

1. *Major agriculture*—The required sequence of courses offered by the department in which the student expects to graduate. These courses constitute the core of specific preparation for the major field.
2. *Related agriculture*—Supporting courses in agriculture selected from closely allied fields. They supplement the major agriculture block.
3. *Science and mathematics*—Courses selected from scientific fields which provide basic biological, physical, social science, and mathematical background and support for the agricultural blocks above.
4. *Humanistic and social*—Courses which provide cultural background for intelligent participation in a complex world society.

### Recommended Preparation

Admission to the School of Agriculture requires high school graduation, with appropriate grades and aptitude test scores. A student who anticipates enrolling in an agricultural major will find a strong background in mathematics and physical and biological sciences to be advantageous.

### PROGRAMS

Curricula are offered in the following majors in the School of Agriculture: agricultural engineering, agricultural management, agricultural science, animal science, crop science, dairy science, dietetics and food administration, food science, fruit science, mechanized agriculture, natural resources management, ornamental horticulture, poultry industry, and soil science.

The Agricultural Education Department provides an additional program of courses required of prospective secondary agriculture teachers.

The Animal Sciences and Industry Department offers veterinary science courses supportive of the animal science and dairy science majors. It also offers a 12-week course in horseshoeing in the fall and spring quarters.



## Laboratory Safety

Students are required to meet sanitation and safety regulations in laboratories. These regulations will be explained by the instructor at the first meeting of the class.

## AGRICULTURAL ENTERPRISE PROJECT FACILITIES

The School of Agriculture utilizes the student enterprise program of the California Polytechnic State University Foundation to provide practical experience which complements the regular production courses. This enterprise program leads to a fuller understanding of important production and managerial problems in agriculture.

The School of Agriculture operates a campus farm and the entire farm with its equipment, buildings, and livestock is available to students for their use in conducting a wide variety of agricultural enterprise projects.

The University Foundation has some of the best breeding flocks and herds of livestock in the State. In addition to the 150 registered Hereford, Angus and Shorthorn beef cattle, there is a 200-cow commercial beef herd which provides experience in typical range cattle management. All necessary equipment for beef cattle production—barns, dehorning and loading chutes, corrals, stock horses, etc.—is available.

The Foundation swine herd consists of two major breeds—Yorkshires and Hampshires. The facilities include a 10-unit farrowing house and outside lots and pastures for the brood sows. In addition there are 12 feeder units for student projects having a capacity of approximately 20 market hogs per unit. Student projects market between 400 and 500 market hogs each year.

The Foundation breeding flock of sheep is made up of two breeds—Hampshire and Suffolk. From 20 to 40 breeding ewes are maintained in each of the breeds, giving the students an opportunity of carrying on typical purebred breeding operations. Opportunities are offered for work with a typical commercial sheep flock of 300 ewes. Students also have the opportunity of learning shearing and care of wool as well as lamb production.

The dairy herd includes purebred Jerseys, Guernseys, and Holsteins. Equipment includes all the necessary facilities for feeding and milking, care of calves and bulls, artificial insemination, milk testing, bottling, separating, and creamery operations. Students conducting dairy projects carry out their operations on a separate grade A dairy.

The poultry flock consists of between 10,000 and 12,000 birds. The equipment includes a modern incubator, egg-handling facilities, brooders and brooder houses, pens for trap-nesting and pedigree work. Students care for all operations under the supervision of the technicians.

The Natural Resources Management Department has faculty expertise and facilities available for raising Christmas trees and for wood production. Students conducting forestry projects learn all aspects of tree farming from establishment to marketing.

The Ornamental Horticulture Department occupies a unit consisting of fifteen greenhouses and six shade houses together with a sales unit and two large labs used for nursery instruction. Student projects are operated in all phases of nursery work. Equipment includes all of the essential machinery necessary for operation of a modern unit.

The Crop Science Department is well equipped with all types of machinery found on mechanized farms in California. All of the farming operations are carried on by the students under the supervision of the Crop Science Department through project class work or paid student labor. Orchards, vineyards, crop land, fruit and vegetable packing facilities and marketing outlets are available for instructional purposes.

The Agricultural Engineering Department operating and servicing all of the mechanized equipment on the campus provides many opportunities for students to learn practical farm machinery maintenance and repair. The major part of the maintenance work is handled by students under faculty supervision.

The Soil Science Department is equipped for the accurate analysis of soil with modern equipment and facilities. Under faculty supervision, Enterprise students have the opportunity to learn the management and operation of a soil testing program. The students provide soil data and information to home owners and growers for fertilizer practices in San Luis Obispo County.

## TECHNICAL CURRICULA IN AGRICULTURE

In keeping with the university-wide policy of offering major courses which lead to occupational competency from the beginning of the first year of the four-year sequence, it is essential to provide opportunity for students who may find it impossible to complete four-year degree programs to obtain as early as possible a concentration of production courses with a minimum of supporting material.

A technical two-year curriculum is available in each of the following agriculture areas: animal science, crop science, dairy husbandry, dairy products technology, food science, fruit science, ornamental horticulture-floristry, ornamental horticulture-nursery, and poultry industry. These curricula include a smaller number of nonagricultural courses than are included in the degree programs. This permits the student to acquire the basic fundamentals in the curriculum and a greater freedom of choice of subjects in agricultural production courses. A student not wishing to enroll in a degree curriculum will find that a two-year curriculum offers a maximum opportunity to select courses which will apply directly to an agricultural career.

Upon completion of 98 required units, a student will receive a technical certificate in the major field.

A student enrolled in the technical program will not be allowed to enroll for credit in any 300- or 400-series courses except when prior approval has been obtained by petition for special consideration.

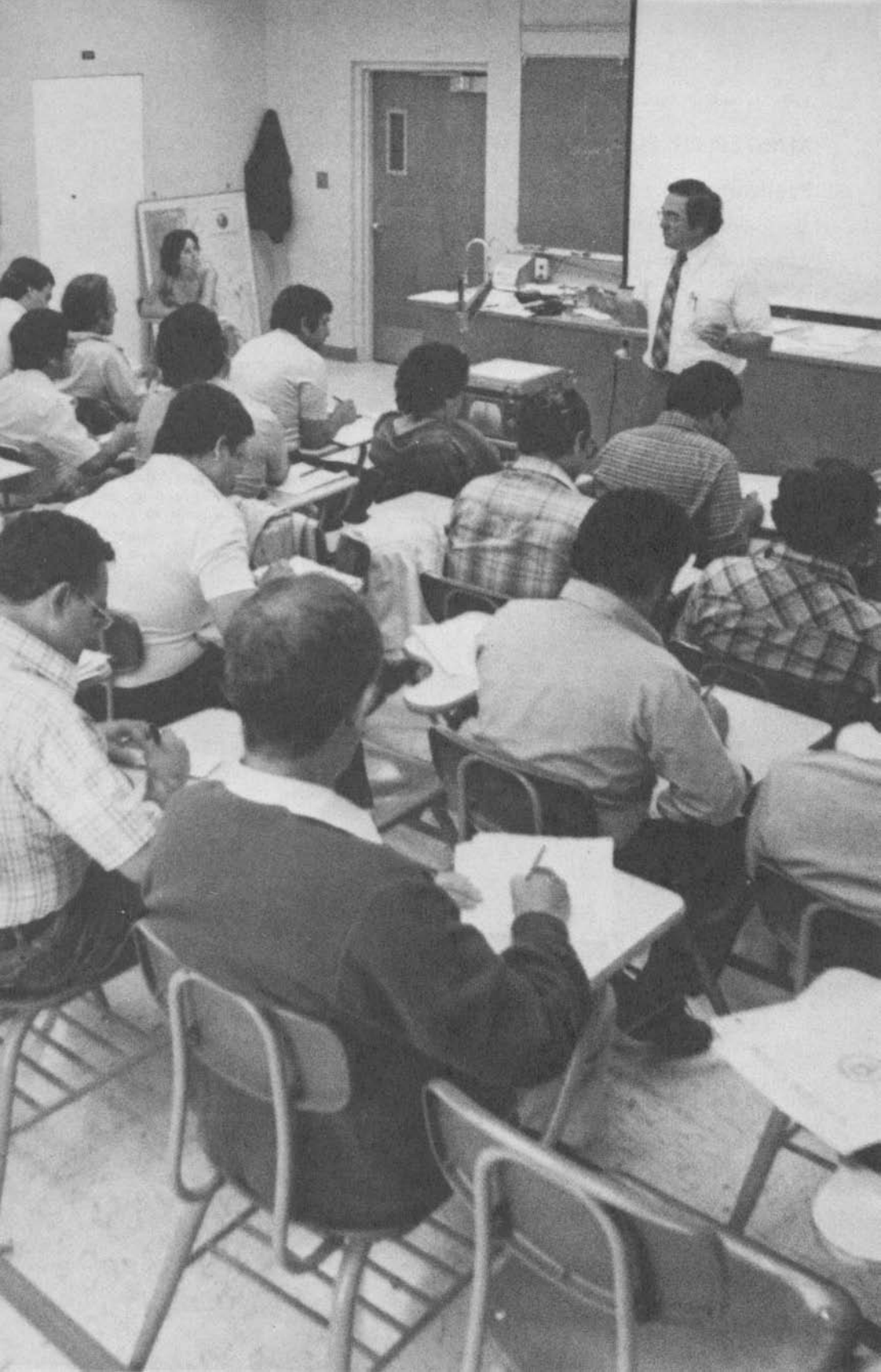
Course or subject area requirements for each technical curriculum are shown in the accompanying table. Detailed curriculum information is available from the dean of the school and the department heads.

A student enrolled in the technical program may not transfer to a degree program except by following the approved university procedure for transfers as outlined in the Campus Administrative Manual, Section 414.

### TECHNICAL CURRICULA IN AGRICULTURE Course or Subject Area Requirements

Required Courses or Subject Areas	* Technical Curricula								
	AnSc	CrSc	DH	DPT	FdSc	FrSc	OHFI	OHNr	PI
<i>Non-Agricultural Courses</i>									
BOT 121 or BIO 101/105 .....	4	4	X	X	X	X	X	X	X
ENGL 114 .....	4	4	X	X	X	X	X	X	X
POLS 210 .....	3	3	X	X	X	X	X	X	X
HIST 204 .....	3	3	X	X	X	X	X	X	X
MATH 102 .....	3	3	X	X	X	X	X	X	X
PE 250 .....	2	2	X	X	X	X	X	X	X
<i>Courses in the Department</i> .....	20	24	30	28	26	24	21	35	22
<i>Agricultural Support Courses</i>									
Agricultural Engineering .....	8	8	11	0	0	8	0	0	4
Agricultural Management .....	7	7	4	4	0	7	3	6	7
Crop Science .....	4	8	4	0	0	8	0	8	0
Soil Science .....	4	8	0	0	0	8	0	8	0
Other Agriculture .....	5	0	5	6	28	0	0	0	6
<i>Non-Agricultural Support Courses</i> .....	0	0	0	7	14	0	30	11	13
<i>Electives in Major</i> .....	11	0	0	0	0	0	15	0	0
<i>Free Electives</i> .....	20	24	25	34	11	24	10	11	27
<b>Total Units</b> .....	98	98	98	98	98	98	98	98	98

<sup>1</sup> Full names of the technical curricula: animal science, crop science, dairy husbandry, dairy products technology, food science, fruit science, ornamental horticulture-floristry, ornamental horticulture-nursery, and poultry industry.



## MASTER OF SCIENCE DEGREE—AGRICULTURE

### Programs

M.S. Agriculture with Specializations in:

General Agriculture  
International Agricultural  
Development

Mechanized Agriculture  
Soil Science

### General Characteristics

Graduate studies in the School of Agriculture allow the student to pursue either a professional program designed to enhance the competencies of agricultural educators, or an academic program of graduate-level scholarly activities and research in one of several disciplines. The Master of Science degree program is intended to prepare graduates for (a) professional-level positions with private business and industry, government, and foreign service in agriculture and related fields; (b) agricultural teaching in secondary schools or community colleges; or (c) continued graduate work at other institutions. Although individual departments in the school do not offer advanced degrees, students may emphasize in their studies agricultural education, international agriculture, mechanized agriculture, soil science, crop science, food science and nutrition, natural and forest resources, or water resources. Applicants must select the specialization which is appropriate for the area of emphasis. The specializations are General Agriculture, International Agriculture Development, Mechanized Agriculture, and Soil Science.

### When to Apply

Application filing periods are given on page 114 of this catalog. To ensure adequate processing and full consideration, all application materials should be filed with the Cal Poly Admission's Office before the dates given below; nevertheless, applicants are encouraged to file during the initial filing period.

Fall Quarter .....	August 15
Winter Quarter.....	November 15
Spring Quarter .....	February 15
Summer Quarter .....	May 15

### Prerequisites

Consideration for admission to this program as a classified graduate student requires a minimum grade point average of 2.75 in the last 90 quarter units attempted. An applicant not meeting these academic standards, but who meets the basic university standard of a grade point average of 2.5 in the last 90 quarter units attempted may be considered for admission as a postbaccalaureate student; such admission does not constitute admission to graduate degree standing (refer to page 115). A change from postbaccalaureate status to graduate status requires application and additional processing through the university's admissions office.

An applicant meeting the grade point requirement for classified graduate status, but who is deficient in background courses in agriculture, natural resources and/or related support disciplines may be considered for admission as a conditionally classified graduate student. Before such a student is advanced to classified graduate status, deficiencies in prerequisites must be removed and satisfactory academic performance in a graduate program must be demonstrated by the completion of no fewer than 12 units of specified courses with a minimum grade point average of 3.0. Courses taken to remove deficiencies in prerequisites will not count toward the unit requirement for the degree.

All applicants who do not speak and write English as their primary language are required to complete the Test of English as a Foreign Language (TOEFL), with a minimum score of 550.

### Program of Study

The School of Agriculture graduate program includes the following specializations: General Agriculture, International Agricultural Development, Mechanized Agriculture, and Soil Science. These specializations are founded on a core of courses which include thesis (required of all except

agricultural educators) or internship (required of agricultural educators), a research methods or educational program development course, and one of the graduate seminars offered in the school. Although the program offers four specializations, there is a single degree; students may not earn more than one degree in the School of Agriculture.

The thesis is based on independent, supervised research; students should contact individual departments to determine the availability of funding support for their research. The final copy of the thesis must meet the standards explained in the "Manual of Instructions for the Preparation and Submission of the Master's Thesis or Master's Project" available from the Cal Poly Graduate Studies Office. At least one course in statistical methods and/or experimental design is required of students in a thesis curriculum.

Graduate students must file the formal program of study for the degree with the Graduate Studies Coordinator of the School of Agriculture by no later than the end of the quarter in which the 12th unit of approved courses is completed. The formal program of study must include at least 45 units of committee-approved graduate course work; at least 23 of these units must be at the 500 level. Students should refer to the course descriptions in this catalog for credit limitations of individual courses; for example, total credit for AG 500, Individual Study, is limited to six units.

Students also should refer to the Graduate Program Guidelines obtainable from the School's Graduate Studies Coordinator.

All students must pass the graduation writing requirement by earning a score of 10 or higher (12 possible) on the Junior Writing Test or by completing ENGL 302 or ENGL 318 with a grade of A or B during their first quarter in residence. ENGL 302 or ENGL 318 may not be used to satisfy course or unit requirements in the Master of Science program.

All students are required to pass both a written and an oral comprehensive examination which normally are given during the final quarter of the program of study. Successful completion of the written comprehensive examination is required before the student may take the final oral comprehensive examination. For students in a thesis program, the final oral comprehensive examination will include, but not necessarily be limited to, a defense of the thesis.

Requirements of the various specializations are given in the curriculumsplay following this section. Please note that the General Agriculture Specialization is designed for either agricultural educators or others who seek graduate work (including thesis-directed research) in certain disciplines not having a specialized curriculum; these disciplines include crop science, food science and nutrition, natural and forest resources, and water resources.

## Curriculum for the Master of Science Degree with a Specialization in General Agriculture

	<i>Units</i>
Core Courses .....	12
Required of agricultural educators:	
AG 539 Internship (6)	
AGED 520 Program Development in Agricultural Education (3)	
Any 581 Graduate Seminar offered in School of Agriculture (3)	
Required of students other than agricultural educators:	
AG 599 Thesis (6)	
400- or 500-level research methods course (3)	
Any 581 Graduate Seminar offered in School of Agriculture (3)	
Restricted electives .....	27
Any approved 400- and 500-level agriculture courses. At least 9 units must be selected from AE 521, AE 522, AGED 522, CRSC 521, NRM 502, SS 521, VGSC 521, or any of the 581 courses offered in the School of Agriculture. No less than 18 units must be at the 500 level.	
Electives .....	6
Any 400- and 500-level course approved by the student's graduate committee. All agricultural education students will be required to complete one year of successful teaching or graduate level internship prior to the final examination.	

**Curriculum for the Master of Science Degree with a  
Specialization in International Agricultural Development**

	<i>Units</i>
Core Courses .....	12
AG 599 Thesis (6)	
400- or 500-level research methods course (3)	
Any 581 Graduate Seminar offered in School of Agriculture (3)	
Required in the area of specialization .....	26
AM 435, AM 510, AM 515, AM 516, CRSC 525, POLS 510, and courses approved by the School's Graduate Studies Committee.	
Global Requirement .....	3
Select 1 area of concentration (specified courses or courses approved by the School's Gradu- ate Studies Committee):	
Africa-POLS 468	
Latin America	
Asia-POLS 417	
Electives .....	6
Electives may be selected from any 400- or 500-level course approved by the student's graduate committee bearing any School of Agriculture prefix.	

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**Curriculum for the Master of Science Degree with a  
Specialization in Mechanized Agriculture**

	<i>Units</i>
Core courses .....	12
AG 599 Thesis (6)	
400- or 500-level research methods course (3)	
AE 581 Graduate Seminar in Agricultural Engineering (3)	
Required in the specialization .....	9
AE 521, AE 522, AE 533	
Restricted electives .....	18
At least 9 units must be in computer related course work; remaining units must be selected from CRSC 521, NRM 502, SS 521, VGSC 521, or other courses approved by the School's Graduate Studies Committee. At least 3 units must be at the 500 level.	
Electives .....	6
400- and 500-level courses approved by the student's graduate committee.	

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**Curriculum for the Master of Science Degree with a  
Specialization in Soil Science**

Prerequisite: A B.S. degree in Soil Science, related field or physical or biological sciences, or a B.A. degree with proficiency in the basic sciences (chemistry, physics, botany, biology, and statistics). A computer science or applied computer science course. Students may complete prerequisite courses at Cal Poly if necessary.

	<i>Units</i>
Core courses .....	12
AG 599 Thesis (6)	
SS 501 Scientific Investigation (3)	
SS 581 Graduate Seminar in Soil Science (3)	
Required in the specialization .....	9
SS 508, SS 521, SS 522	
Electives .....	24
400- and 500-level courses approved by the student's graduate committee. At least 6 units of electives must be from outside of the School of Agriculture.	
	45

For further information or advisement students should communicate with the Dean of the School of Agriculture.

**Agribusiness Specialization in the MBA Program**

The School of Business and the Agricultural Management Department jointly offer an Agribusiness Specialization in the Master of Business Administration program. The program is part of the two-year MBA curriculum and requires the completion of six graduate classes taught by the Agricultural Management Department. Information and application materials may be obtained by writing to the MBA Coordinator, School of Business.

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## AGRICULTURAL EDUCATION DEPARTMENT

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### Faculty

**Department Head, Joseph E. Sabol**

Glen R. Casey

Robert A. Flores

William C. Kellogg

### Programs

B.S. Agricultural Science with Concentrations in:

Agricultural Mechanics

Animal Production

Agricultural Products and Processing

Ornamental Horticulture

Agricultural Resources Management

Plant Production

Agriculture Supplies and Services

The primary function of the Agricultural Education Department is to provide for the preparation of teachers of agriculture for the public secondary schools of California. Specialized pre-professional and professional courses are offered for undergraduates and graduate students.

Students interested in teaching agriculture may receive a Bachelor of Science degree in any of the agricultural science production or management fields. Course work toward the teaching credential should be started early in order to complete the total curriculum most effectively.

The department offers a Bachelor of Science degree in Agricultural Science which includes a credential preparation program providing for early field experience and undergraduate student teaching.

Student teaching may also become a part of the graduate program for agriculture majors. Candidates must complete a minimum of 45 quarter units of postgraduate course work necessary for the "clear" teaching credential.

Agricultural education courses may be used to fulfill many of the units required for the Master of Science degree with a specialization in General Agriculture. Detailed information may be obtained in the office of the Dean of the School of Agriculture.

### CURRICULAR CONCENTRATIONS

#### **Agricultural Mechanics**

A selection of courses designed to develop knowledge and ability necessary to perform agricultural mechanical operations and processes.

#### **Agricultural Products and Processing**

A selection of courses concerned with the principles and practices involved in the science and technology of agricultural products.

#### **Agricultural Resources Management**

A selection of courses stressing the principles and practices involved in the conservation, multiple use or improvement of natural resources.

#### **Agricultural Supplies and Services**

A selection of courses which stresses providing the consumable supplies and services needed in the production phase of agriculture.



### Animal Production

A selection of courses stressing principles and practices related to the economic use of resources in the production of livestock and poultry.

### Ornamental Horticulture

A selection of courses stressing the principles and practices involved with the culture of plants used for ornamental or aesthetic purposes.

### Plant Production

A selection of courses stressing principles and practices related to the economic use of resources in the culture and production of agricultural plants.

## CURRICULUM IN AGRICULTURAL SCIENCE

### Freshman

	F	W	S
AE 121/AE 122 Agricultural Mechanics .....		2	
AE 141 Agricultural Tractors and Equipment Skills .....			3
AGED 202 Introduction to Agricultural Education .....	2		
ASCI 230 General Animal Science .....	4		
BOT 121 General Botany (B.1.b.) .....		4	
CRSC 230 General Field Crops and/or FRSC 230 California Fruit Growing and/or VGSC 230 General Vegetable Crops .....	4	4	
DH 230 General Dairy Husbandry .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
MATH 114 College Algebra (B.2.) .....	3		
ZOO 131 General Zoology (B.1.b.) .....			4
Agriculture courses to complete major .....		7	4
	17	17	15

### Sophomore

AE 340 Irrigation Water Management .....			4
AGED 303 F.F.A. Programs and Activities .....		2	
AGED 339 Supervised Agricultural Experiences .....			2
AM 201 Agricultural Business Sales and Service .....	3		
CHEM 121 General Chemistry (B.1.a.) .....	4		
ECON 201 Survey of Economics (D.3.) .....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....	3		
ETWT 144 Manufacturing Processes .....			2
OH 230 Ornamental Gardening .....		3	
PI 230 General Poultry Production .....	3		
PSY 201 General Psychology (E.1.) .....			3
SPC 202 Principles of Speech (A.3.) .....		3	
SS 121 Introductory Soil Science .....	4		
Electives and courses to complete major .....		5	5
	17	16	16

### Junior

AM 250 Computer Application to Agriculture (F.1.) .....			3
AM 301 Agricultural Marketing .....		3	
AM 321 Farm Records .....			4
ED 302 Multicultural Education in the Secondary School .....	3		
ED 305 Teaching and Learning Processes .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
HIST 204 History of American Ideals and Institutions (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
POLS 210 American and California Government (D.1.) .....			3
GEOG 150 Human Geography (D.4.a.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....	3		
<sup>1</sup> Mathematics or statistics elective (B.2.) .....		3	
Agriculture courses to complete major .....	4	5	3
	16	17	17

Senior	F	W	S
AGED 438 Instructional Processes in Agricultural Education .....	3		
AGED 441 Student Teaching Practicum or			
AGED 463 Undergraduate Seminar .....		2	
AGED 461, AGED 462 Senior Project .....	2	2	
ECON 325 Underdevelopment and Economic Growth (D.4.b.) ..			3
ED 403 Reading Methods in the Secondary School .....		3	
ED 404 Field Experience in Secondary School Reading .....	3		
ED 405 Diagnosis, Prescription and Evaluation .....	2		
PE 250 Health Education (E.2.) .....			2
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (3 units at			
300-400 level) (C.3.) .....		3	3
Agriculture courses to complete major .....	4	3	6
	17	16	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Agricultural Education and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

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## AGRICULTURAL ENGINEERING DEPARTMENT

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### Faculty

#### Department Head, Edgar J. Carnegie

James Bermann  
George M. Brown III  
Charles M. Burt  
Paul H. Dilger  
L. Joe Glass

Robin R. Grinnell  
M. Stephen Kaminaka  
Lloyd H. Lamouria  
Glenn W. Salo  
Rollin D. Strohmman

Robert E. Walker  
James P. Webster, Jr.  
Douglas W. Williams  
James B. Zetsche, Jr.

### Programs

B.S. Agricultural Engineering

B.S. Mechanized Agriculture

The Agricultural Engineering Department offers two programs leading to a Bachelor of Science degree: Agricultural Engineering and Mechanized Agriculture.

Department facilities include well-equipped laboratories for hydraulic systems, evaluation and testing of power units, fabrication of agricultural machinery, agricultural electrical systems, design and construction of agricultural structures, photogrammetry, microcomputers and controllers.

Outdoor facilities include a field for evaluation of various irrigation systems including an operating linear move and land for experience in the production of farm products and operation of agricultural machinery.

Students are encouraged to participate in the student clubs of the department. The Agricultural Engineering Society is composed of Mechanized Agriculture and Agricultural Engineering majors and is involved in a broad range of activities and services including Homecoming, and Poly Royal displays. The student branch of the American Society of Agricultural Engineers and the Student Mechanization Branch offer an active program of professional and extracurricular activity.

### AGRICULTURAL ENGINEERING MAJOR

Agricultural engineers provide the engineering necessary for the development of agriculture. The agricultural engineer represents the most general type of engineer, adept at utilizing electrical and mechanical energy sources and water resources and designing structural units. The curriculum features a unique combination of engineering and agricultural course work designed to prepare the graduate to assume a productive role in society.

Employment opportunities exist primarily in the design, evaluation and management of systems encompassing irrigation, drainage, hydrology, soil conservation; farm machinery; food processing; and agricultural environments. Manufacturers, consulting engineers, and governmental and private agencies are the primary employers.

The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

**CURRICULUM IN AGRICULTURAL ENGINEERING**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
AE 128 Agricultural Mechanics .....	3		
AE 143 Power and Machinery .....		4	
AE 237 Engineering Surveying .....			2
ENGR 251 Digital Computer Applications (F.1.) .....			2
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ETME 141 Applied Descriptive Geometry .....		2	
ETME 142 Engineering Drawing Systems .....			1
ETMP 144 Manufacturing Processes: Machining I .....	2		
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
SS 121 Introductory Soil Science .....	4		
<sup>1</sup> Critical reading elective (C.1.) .....			3
	17	17	16
<b>Sophomore</b>			
AE 232 Agricultural Structures Planning .....			3
AE 236 Principles of Irrigation .....	4		
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ....		4	
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....		4	4
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....			3
ETME 143 Engineering Drawing Systems .....	1		
ETWT 144 Manufacturing Processes .....		2	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
ME 211, ME 212 Engineering Mechanics .....		3	4
PHYS 133 General Physics (B.1.a.) .....	4		
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
Elective .....			3
	16	17	17
<b>Junior</b>			
AE 312 Hydraulics .....	4		
AE 315 Hydrology .....		3	
AE 326 Off-the-Road Locomotion .....			3
AE 328 Computer Interfacing and Measurements .....		3	
AE 331 Irrigation Theory .....		3	
AE 333 Finite Element Analysis Applications .....			3
CE 204, CE 205, CE 206 Strength of Materials and Laboratory ....		3	3
EE 201 Electrical Circuit Theory .....	3		
EE 261 Electric Circuits Laboratory .....	1		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
ME 302 Thermodynamics .....	3		
POLS 210 American and California Government (D.1.) .....			3
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
STAT 321 Statistical Analysis .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOP/POLS/SOC elective (D.4.b.) .....		3	
	18	18	18

Senior	F	W	S
AE 403 Agricultural Systems Engineering .....			3
AE 414 Irrigation Engineering .....			4
AE 421, AE 422 Equipment Engineering .....	4	3	
AE 427 Agricultural Process Engineering .....		3	
AE 433 Agricultural Structures Design .....	4		
AE 461, AE 462 Senior Project .....	2	2	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
HUM 402 Human Values (C.3.) .....		3	
IE 314 Engineering Economics .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
Elective .....	3		
	16	17	16

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)



## MECHANIZED AGRICULTURE MAJOR

This major gives the student broad agricultural training with emphasis on the applied mechanical phases of agriculture. Business and management courses also are emphasized. Nine units of electives enable the student to tailor his or her degree program in mechanized agriculture toward those emphasis areas which suit his or her career objectives. Emphasis areas include business, agricultural management, crop science, animal science, or industrial technology and irrigation system management.

Career opportunities are available in sales and service of farm equipment and machinery, fabrication and design of agricultural equipment, teaching vocational agriculture with an emphasis on agricultural mechanics, and management of machinery systems for a farm or ranch.

## CURRICULUM IN MECHANIZED AGRICULTURE

Freshman	F	W	S
AE 128 Agricultural Mechanics .....		3	
AE 133 Agricultural Drafting .....	3		
AE 141 Agricultural Tractors and Equipment Skills .....	3		
AE 142 Agricultural Power and Machinery Management .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ETMP 144 Manufacturing Processes: Turning-Milling and			
ETMP 145 Manufacturing Processes .....	2	1	
ETWT 144 Manufacturing Processes .....		2	
ETWT 155 Industrial Welding Technology .....			1
<sup>1</sup> MATH 113 Algebra .....	3		
<sup>1</sup> MATH 114 College Algebra (B.2.) .....		3	
<sup>1</sup> MATH 115 Trigonometry (B.2.) .....			3
SS 121 Introductory Soil Science .....		4	
Animal production elective .....			4
Plant production elective .....			4
	15	16	16
<b>Sophomore</b>			
ACTG 211 Financial Accounting for Nonbusiness Majors .....			4
AE 134 Agricultural Electrification .....	3		
AE 231 Agricultural Building Construction .....	3		
AE 234 Agricultural Power Transmission and Mechanics .....		3	
AE 237 Engineering Surveying .....	2		
AE 335 Agricultural Power .....		3	
AE 341 Gasoline Engine Diagnosis .....			3
AM 250/CSC 110/CSC 120 (F.1.) .....	3		
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....		4	
PHYS 121, PHYS 122, PHYS 123 College Physics (B.1.a.) .....	4	4	4
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
Electives .....	3	3	3
	18	17	17

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
AE 323 Agricultural Products Handling .....			3
AE 340 Irrigation Water Management .....	4		
AE 342 Diesel Fuel Systems .....			3
AE 343 Project Analysis .....	5		
AE 344 Agricultural Equipment Projects .....		3	
AE 347 Principles of Agricultural Machinery .....		4	
BUS 201 Business Law Survey .....			3
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....			3
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....		3	
	16	17	19
<b>Senior</b>			
AE 301 Closed Circuit Hydraulics .....	3		
AE 324 Principles of Agricultural Electrification .....		4	
AE 425 Computer Controls for Agriculture .....			3
AE 432 Agricultural Buildings .....			4
AE 461, AE 462 Senior Project .....	2	2	
AE 463 Undergraduate Seminar .....	2		
AM 312 Agricultural Policy .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
HUM 402 Human Values (C.3.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
<sup>2</sup> Critical reading elective (C.1.) .....	3		
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
	16	15	16

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Agricultural Engineering and other subjects.

<sup>1</sup> MATH 118 and MATH 119 may be substituted for MATH 113, MATH 114, MATH 115 series.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

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## AGRICULTURAL MANAGEMENT DEPARTMENT

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### Faculty

#### Department Head, M. LeRoy Davis

James J. Ahern  
 Renny J. Avey  
 Gaylord J. Chizek  
 Arthur C. Duarte  
 Douglas G. Genereux  
 George J. Hellyer  
 William F. Kaminer

H. Clay Little  
 Robert E. McCorkle  
 Steven D. McGary  
 William K. Michaud  
 Nancy C. Morris  
 John A. Rogalla

Allen E. Rosenfeld  
 David J. Schaffner  
 Jack F. Scott  
 Robert C. Thompson  
 Stanton G. Ullerich  
 Marlin D. Vix

### Programs

#### B.S. Agricultural Management

#### Minor: Agricultural Management

The Bachelor of Science degree in Agricultural Management emphasizes training in management for careers in agriculture. The curriculum is based on a solid background in production agriculture which provides for depth and breadth in agricultural management techniques. The thrust of the program is to prepare students for careers in the management and operation of farms as well as in the management procedures required by firms that supply the service to farms and by those engaged in processing, marketing, distribution and sales of farm products.<sup>1</sup>

### CURRICULAR CONCENTRATIONS

#### Agricultural Finance and Appraisal

Graduates of this concentration find employment opportunities with a variety of agricultural lending institutions such as commercial banks, the Farm Credit System, Farmers Home Administration, and large insurance companies. Positions include loan officer, branch manager, in-house appraiser and product specialist. Other possible careers include those of fee appraiser, financial officer in a large agricultural firm, and agricultural real estate sales.

#### Agricultural Marketing

Career placement opportunities for graduates of this concentration involve management operations of agribusiness firms providing supplies and service to farmers and by those firms engaged in marketing, distribution, and sales of farm products. These careers include sales representatives for agricultural chemical organizations and fertilizer companies and may lead into more responsible management positions. Other careers are found in fresh fruit and vegetable marketing, advertising, food chains, food processing, and agricultural county and district fairs.

#### Agricultural Policy

This concentration prepares students for employment as policy analysts and lobbyists for public agencies as well as private firms and organizations. Typical employers include agribusiness, farm organizations, commodity associations, agribusiness trade associations, government regulatory agencies and federal and state legislatures. The curriculum has been designed to enable students to meet the need of these employers by acquiring abilities to analyze the impacts of U.S. and foreign farm, food, resource, and trade policies.

<sup>1</sup> The Business Administration major is distinguished from the major in Agricultural Management. The major in Business Administration provides students with the knowledge and analytical skills essential for employment in all sectors of business and industry, as well as for managerial careers in governmental and other non-profit organizations. Opportunities for specialization are provided for students preparing for careers in accounting, financial management, marketing management, management information systems, international business management, general management, production and operations management, and human resources management.



**Farm and Ranch Management**

The successful American family farm or ranch is large enough and sufficiently complicated to require its operator to be qualified through professional management training and experience. Many Farm and Ranch Management graduates return to the family farm and, after gaining the seasoning of further experience, carry the farm business to greater levels of success. Graduates without family farm connections may find employment as supervisors on a large scale farm or ranch and advance to greater responsibility.

**CURRICULUM IN AGRICULTURAL MANAGEMENT****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
AM 101 Introduction to Agricultural Management .....	3		
AM 102 Introduction to Agricultural Economics .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
ASCI 202/DH 101/DH 102/FDSC 230/AE 142 .....			3
CRSC/FRSC/VGSC elective .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 118/MATH 121 .....		3	
MATH 114/MATH 121/MATH 221 (B.2.) .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Life sciences elective (with lab) (B.1.b.) .....		4	
<sup>2</sup> Electives .....	5	3	4
	16	16	16

**Sophomore**

ACTG 211 Financial Accounting .....		4	
AM 201 Agricultural Business Sales and Service.....		3	
AM 203 Agricultural Business Organization.....	3		
AM 212 Agricultural Economics .....		3	
AM 213 Agricultural Economic Analysis .....			4
AM 250 Computer Application to Agriculture (F.1.) .....			3
CHEM 121 General Chemistry (B.1.a.) .....	4		
ECON 222 Macroeconomics (D.3.) .....	4		
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
STAT 211/STAT 251 and STAT 212/STAT 252 (B.2.) .....		3	3
<sup>2</sup> Electives .....	2	4	4
	17	17	17

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
AM 301 Agricultural Marketing .....	3		
AM 310 Agricultural Credit and Finance .....	3		
AM 312 Agricultural Policy .....		3	
AM elective (300-400 level) .....			3
HIST 315 Modern World History (D.2.) .....	3		
PE 250 Health Education (E.2.) .....			2
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
POLS 210 American and California Government (D.1.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
SS 121 Introductory Soil Science.....		4	
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Science elective (life sciences with lab) or CHEM 122 General Chemistry (B.1.) .....			4
<sup>2</sup> Electives and courses to complete major .....	5	4	5
	17	17	17
<b>Senior</b>			
AM 401 Agricultural Labor Relations and Personnel Management .....	4		
AM 461, AM 462 Senior Project .....	2	3	
AM elective (300-400 level) .....		3	
BUS 207 Business Law .....			4
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3		3
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		6	
<sup>2</sup> Electives and courses to complete major .....	7	4	6
	16	16	16

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> Electives must include 20 units to be selected in Agriculture with prefixes other than AM or AGED. Of these units, 6-8 must be selected from the following courses: AE 340, ASCI 302, CRSC 221, CRSC 311, DH 301, SS 221, VS 203, VS 302.

## AGRICULTURAL MANAGEMENT MINOR

In today's ever more complex, technology-driven world, it is a necessity for any graduate in agriculture to have some exposure to marketing, personnel management, financial management, budgeting, and economics if they are to succeed. The minor in Agricultural Management is designed to give students in the School of Agriculture this opportunity. Interested students must apply for acceptance into the minor through the Agricultural Management Department. Students must be formally admitted to the minor prior to completion of more than twelve units in the minor.

The minor in Agricultural Management offers students two areas of emphasis. *Agricultural production management* emphasizes management of the farm or ranch as an enterprise and *agricultural marketing* focuses on sales and marketing of agricultural commodities.

Units

Required courses..... 17

- ACTG 211 Financial Accounting for Nonbusiness Majors (4)
- AM 212 Agricultural Economics (3)
- AM 301 Agricultural Marketing (3)
- AM 310 Agricultural Credit and Finance (3)
- AM 401 Agricultural Labor and Personnel Relations (4)

Courses in area of emphasis ..... 10-11

Select one of the following areas of emphasis:

### *Agricultural Production Management* (11)

- AM 321 Farm Records (4)
- AM 322 Principles of Farm Management (4)
- AM 413/AM 415/AM 416 (3)

### *Agricultural Marketing* (10)

- AM 201 Agricultural Sales and Service (3)
- AM 323 Agricultural Managerial Accounting (4)
- AM 404 Agricultural Marketing Management (3)

## ANIMAL SCIENCES AND INDUSTRY DEPARTMENT

### Faculty

#### Department Head, John W. Algeo

Russell K. Anderson  
Gene A. Armstrong  
Richard J. Birkett  
James R. Flanagan  
Frank W. Fox, Jr.  
Wallace F. Glidden  
Michael H. Hall  
Roy M. Harris

Max F. Hawkins  
Robert D. Hooks  
Roger M. Hunt  
Richard F. Johnson  
Michael W. Lund  
Roland K. Pautz  
William E. Plummer

Philip L. Potts, Sr.  
Robert T. Rutherford  
Kenneth C. Scotto  
Dale A. Smith  
John V. Stechman  
John W. West  
Robert R. Wheeler

### Programs

#### B.S. Animal Science

#### B.S. Poultry Industry

The department offers the Bachelor of Science degree in Animal Science and the Bachelor of Science degree in Poultry Industry. The educational approach of is to provide students with instruction in theory and practical application of all phases of production.

Instruction in the department also encompasses a diversified cocurricular program including special interest clubs and the sponsorship of championship-calibre national intercollegiate livestock judging teams.

Students in either major may complete a breadth of preveterinary science courses as a complement to their major fields of study. Through this training, students will enhance their qualifications for admission to schools of veterinary medicine throughout the United States.

An Agricultural Management Minor is available to students in both majors. This minor allows for the combination of practical animal production expertise with agricultural business training and provides a unique preparation for graduates not only in technical farming and ranching, but also in allied businesses and industries.

Students interested in the two-year technical certificate in Animal Science or Poultry Industry should refer to the introductory statement for the School of Agriculture, which describes this program. Detailed curriculum information is available from the department head.

### ANIMAL SCIENCE MAJOR

The Bachelor of Science degree in Animal Science educates men and women for the occupation of farming where beef cattle, horses, sheep, and swine enterprises are an important part of the industry. The majority of graduates from the department are engaged in the livestock and farming business or are employed as ranch workers or managers.

Livestock feeding yards, feed mills, auction sales companies, meat packers, commission firms, and other organizations servicing the livestock industry are sources of employment for graduates. Other employment fields include agricultural teaching, agricultural extension work, and agricultural research in the areas of animal nutrition, genetics, reproductive physiology and biotechnology. The department allows wide latitude in the selection of elective courses so that students may pursue a secondary emphasis area or broaden the cultural base of their total college education.

Students are provided with instruction in theory and application of all phases of livestock production and range management. To this end the department maintains purebred and commercial

instructional herds of the chief meat animal species, and a brood mare band of thoroughbreds and quarter horses. The university herds and flocks are extensively used for laboratory and applied studies of management, feeding, breeding, and marketing techniques and procedures. More than 4000 acres of campus land are devoted to instruction in the animal sciences.

The student is encouraged to augment classroom and laboratory instruction through participation in the varied enterprise programs operated by the California Polytechnic State University Foundation. Through these programs large numbers of student-owned beef cattle, sheep and hogs are grazed, fed and marketed each year. Provision also is made to give the students an opportunity to own and manage, in partnership with the Foundation, a commercial cow herd, a prototype range band of ewes, and enterprises of quarter horses and thoroughbreds are available.



**CURRICULUM IN ANIMAL SCIENCE****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
ASCI 111    Market Beef Production .....		3	
ASCI 112    Elements of Swine Production .....	3		
ASCI 113    Elements of Sheep Production .....			3
ASCI 241    Applied Beef Cattle Practices .....		2	
ASCI 242    Applied Swine Management Practices .....	2		
ASCI 243    Applied Sheep Management Practices .....			2
AE 121/AE 122    Agricultural Mechanics .....	2		
CHEM 121, CHEM 122    General Chemistry .....		4	4
ENGL 114    Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125    Critical Thinking (A.2.) .....		3	
PE 250    Health Education (E.2.) .....	2		
SPC 201    Public Speaking or			
SPC 202    Principles of Speech (A.3.) .....			3
ZOO 131    General Zoology (B.1.b.) .....		4	
<sup>1</sup> Mathematics elective (B.2.) .....	3		
Electives .....	2		5
	<u>18</u>	<u>16</u>	<u>17</u>

**Sophomore**

ASCI 202    Feeds and Feeding .....	3		
ASCI 240    Applied Feeds and Feeding .....	2		
VS 123    Anatomy and Physiology .....		3	
VS 203    Animal Parasitology .....		3	
BACT 221    General Bacteriology (B.1.b.) .....	4		
CHEM 326    Survey of Organic Chemistry .....			4
CRSC 123    Forage Crops .....			4
FDSC 210    Meats .....			3
HIST 204    History of American Ideals and Institutions (D.1.) ....		3	
PHIL 230/PHIL 231    Philosophical Classics (C.1.) .....		3	
SS 121    Introductory Soil Science .....			4
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....		3	
<sup>1</sup> Mathematics or statistics elective (B.2.) .....	3		
Electives .....	2		2
	<u>17</u>	<u>15</u>	<u>17</u>

Junior	F	W	S
ASCI 302 Applied Animal Nutrition .....		3	
VS 302 Animal Hygiene .....	3		
AM 321 Farm Records .....		4	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
BIO 303 Genetics .....		3	
CHEM 328 Biochemistry (B.1.a.) .....			4
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....	3		
HIST 315 Modern World History (D.2.) .....	3		
POLS 210 American and California Government (D.1.) .....	3		
PSY 202 General Psychology (E.1.) .....			3
<sup>1</sup> Computer science elective or			
AM 250 Computer Application to Agriculture (F.1.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....		3	3
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
Electives .....	4		
	16	16	16
Senior			
ASCI 304 Animal Breeding .....		3	
ASCI 401 Reproductive Physiology .....	4		
ASCI 402 Animal Nutrition .....		4	
ASCI 461, ASCI 462 Senior Project .....	2		2
ASCI 463 Undergraduate Seminar .....		2	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
<sup>2</sup> Animal Science electives .....		4	8
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>3</sup> Electives and courses to complete major .....	6	4	4
	16	17	17

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> To be selected with adviser's approval.

<sup>3</sup> Seven units to be selected from 300-400 level courses in ASCI, DSCI, FDSC, PI, or VS.

## POULTRY INDUSTRY MAJOR

The Bachelor of Science degree in Poultry Industry prepares students for a wide variety of positions in the commercial poultry industry and in many allied services related directly to the industry. Opportunities in the industry are many and varied as evidenced by the fact that graduates have worked in more than fifty types of jobs in the industry.

Poultry students have an opportunity to conduct enterprise projects in the production of market eggs, hatching eggs, meat birds, replacement pullets, turkey, and game birds, which give them valuable experience in production techniques as well as exposure to a number of business activities related to production. Advanced students may have opportunities to study special topics related to problems in management of commercial poultry flocks.

The university has facilities for more than 5,000 adult and over 6,000 growing chickens on approximately 10 acres of land. The poultry unit maintains flocks of a number of breeds and varieties of chickens for both egg and meat production. Flocks of turkeys and several game bird species are maintained in support of the instructional program. A 15,000-egg capacity hatchery is equipped to hatch eggs ranging in size from quail to turkey. A well-equipped poultry processing plant and egg handling and processing facility enables students to gain experience in these areas.

**CURRICULUM IN POULTRY INDUSTRY**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
PI 121 Poultry Industry Development .....	4		
PI 122 Replacement Programs and Broiler Production .....		4	
PI 133 Poultry Incubation .....			3
BOT 121 General Botany (B.1.b.) .....			4
DH 101 Dairy Feeds and Feeding .....	2		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 114 College Algebra (B.2.) .....	3		
PE 250 Health Education (E.2.) .....	2		
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
ZOO 131 General Zoology (B.1.b.) .....		4	
Agricultural Engineering electives .....		2	2
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
Electives .....	2		4
	17	16	16
<b>Sophomore</b>			
PI 221 Poultry Selection and Egg Production .....	3		
PI 222 Poultry Products Processing and Marketing .....		3	
PI 231 Poultry Anatomy and Physiology .....	3		
PI 233 Poultry Plant Design and Equipment .....			2
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
BACT 221 General Bacteriology .....	4		
BIO 303 Genetics .....		3	
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....		3	
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....		3	
Agricultural Engineering or Welding elective .....	2		
<sup>1</sup> Computer literacy elective (F.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
<sup>2</sup> Management elective .....			3
Electives .....	2	2	2
	17	17	17



**Junior**

	<b>F</b>	<b>W</b>	<b>S</b>
PI 331 Turkey Industry .....	3		
PI 322 Poultry Business Organization .....		4	
PI 323 Poultry Diseases and Hygiene .....			4
PI 333 Applied Poultry Feeding and Nutrition .....			4
AM 321 Farm Records or ACTG 221 Financial Accounting I .....	4		
AM 212 Agricultural Economics or ECON 212 Principles of Economics .....		3	
CHEM 121, CHEM 122 General Chemistry .....	4	4	
CHEM 326 Survey of Organic Chemistry .....			4
HIST 204 History of American Ideals and Institutions (D.1.) ...			3
POLS 210 American and California Government (D.1.) .....		3	
Agricultural Engineering elective .....	3		
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....	3		
Electives .....		2	2
	17	16	17

**Senior**

PI 422 Advanced Poultry Enterprise Supervision .....		3	
PI 431 Applied Poultry Breeding .....	4		
PI 461, PI 462 Senior Project .....	2	2	
PI 463 Undergraduate Seminar .....			2
AM 401 Agricultural Labor Relations and Personnel Management .....	4		
ASCI 402 Animal Nutrition .....			4
CHEM 328 Biochemistry (B.1.a.) .....		4	
HIST 315 Modern World History (D.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
<sup>1</sup> Computer science elective .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
<sup>2</sup> Management elective .....		3	
Elective .....			2
	16	15	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Animal Science, Poultry Industry, and Veterinary Science and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> To be selected from BUS 201, MGT 118, MGT 311.

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## CROP SCIENCE DEPARTMENT

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### Faculty

#### Department Head, Corwin M. Johnson

Charles B. Atlee  
Edgar H. Beyer  
A. Charles Crabb  
H. Paul Fountain  
George G. Gowgani

Louis W. Harper  
Robert J. McNeil  
Wesley J. Mueller  
Gene P. Offermann  
John C. Phillips

Edwin C. Seim  
Mark D. Shelton  
Gordon L. Van De Vanter  
David L. Warfield  
Jo Ann C. Wheatley

### Programs

#### B.S. Crop Science

#### B.S. Fruit Science

Two major curricula leading to the Bachelor of Science degree are offered by the Crop Science Department and are designed to prepare students for field, fruit, or vegetable crop production and for employment in related service areas.

Graduates in Crop Science and Fruit Science have attained responsible positions in agronomic and horticultural production, teaching, research, extension, quality control and inspection, and sales and service areas. Opportunities for employment in private industry and governmental sectors are available for those with practical knowledge of agricultural skills and techniques and a good background in the sciences and humanities.

The department has 30 acres of productive citrus, avocados, grapes, deciduous orchard, and berries with over 100 varieties represented. Additional nonbearing acreage for instructional use exists and new plantings are under way. About 300 acres are devoted to student production enterprises in field and vegetable crops. An additional 200 acres of campus farm crop land provide opportunities to gain experience through part-time employment. All departmental majors are encouraged to gain experience and earn income by participation in the project enterprise program or by working for the campus farm.

The technological phases of instruction are enhanced by packing and grading equipment, seed processing equipment, and specialized laboratory equipment for the study of various crops. Field trips supplement instruction for crops not common to the San Luis Obispo area.

Students interested in the two-year technical certificate should refer to the School of Agriculture introductory statement. The department head can supply additional information.

### CROP SCIENCE MAJOR

A student in the Crop Science major must elect to specialize in Agronomy or Vegetable Science or select the Plant Protection minor in the junior and senior years. Employment opportunities for students graduating in the Crop Science major include private or corporate crop production and management, sales and service, positions with commercial pest control firms, government regulatory agencies, and agriculturally related organizations, and as agronomists and horticulturists with government or industry.

**CURRICULUM IN CROP SCIENCE****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
CRSC 131 Introduction to Crop Science .....	4		
CRSC 132 Grain Crops .....		4	
CRSC 133 Row Crops .....			4
BOT 121 General Botany (B.1.) .....	4		
BOT 123 Introductory Plant Taxonomy .....		4	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
LIB 101 Library Instruction .....		1	
MATH 102 Agricultural Mathematics .....		3	
MATH 114 College Algebra (B.2.) .....			3
PE 250 Health Education (E.2.) .....	2		
Agricultural Engineering electives .....	3		3
	<u>17</u>	<u>15</u>	<u>17</u>

**Sophomore**

CRSC 221 Weed Control .....	4		
CRSC 231 Commercial Seed Production and Processing .....		4	
VGSC 232 Vegetable Crops Production .....			4
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry .....			4
ECON 211 Principles of Economics (D.3.) .....		3	
PSY 202 General Psychology (E.1.) .....	3		
SPC 202 Principles of Speech (A.3.) .....			3
SS 121 Introductory Soil Science .....	4		
SS 122 Soil Management or			
SS 221 Fertilizers .....		4	
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
Electives .....	2	2	2
	<u>17</u>	<u>17</u>	<u>16</u>

**Junior**

CRSC 411 Experimental Techniques and Analysis .....	4		
CRSC 311 Applied Insect Pest Management .....	4		
AM 250 Computer Application to Agriculture (F.1.) .....		3	
AM 321 Farm Records .....			4
CHEM 328 Biochemistry (B.1.a.) .....	4		
FRSC 230 California Fruit Growing .....			4
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
Agricultural Management elective (300-400 level) .....		4	
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	2	4	
<sup>2</sup> Electives .....		3	6
	<u>17</u>	<u>17</u>	<u>17</u>

Senior	F	W	S
CRSC 304 Plant Breeding .....			4
CRSC 410 Crop Physiology .....		4	
CRSC 461, CRSC 462 Senior Project .....	2	3	
CRSC 463 Undergraduate Seminar .....			2
BIO 303 Genetics .....	3		
BOT 323 Plant Pathology (B.1.b) .....	4		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
<sup>2</sup> Electives .....	4	3	4
	16	16	16

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> At least four courses to be selected with the approval of the adviser, three of which must be 300-400 level courses.

## FRUIT SCIENCE MAJOR

The Fruit Science major qualifies graduates for orchard or vineyard management or for related employment for packers or canners, fruit inspection, or plant protection. Instruction includes deciduous fruits, nut crops, citrus, avocados, grapes, berries, tropical and subtropical fruits, and minor fruit species. Students may elect to specialize in Fruit Production or select the Plant Protection minor in the junior and senior years.

## CURRICULUM IN FRUIT SCIENCE

Freshman	F	W	S
FRSC 131, FRSC 132, FRSC 133 Pomology .....	4	4	4
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
BOT 121 General Botany and			
BOT 123 Introduction to Plant Taxonomy (B.1.b.) .....	4	4	
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
LIB 101 Library Instruction .....			1
MATH 102 Agricultural Mathematics .....	3		
MATH 114 College Algebra (B.2.) .....		3	
PE 250 Health Education (E.2.) .....		2	
Agricultural Engineering electives .....	2		4
<sup>1</sup> Elective .....			1
	17	16	17

### Sophomore

FRSC 231 Viticulture .....	4		
FRSC 232 Citrus and Avocado Fruit Production .....		4	
BOT 323 Plant Pathology (B.1.b.) .....			4
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry .....			4
CRSC 221 Weed Control .....			4
ECON 211 Principles of Economics (D.3.) .....		3	
SPC 202 Principles of Speech (A.3.) .....	3		
SS 121 Introductory Soil Science .....	4		
SS 122 Soil Management or			
SS 221 Fertilizers .....		4	
<sup>1</sup> Electives .....	2	2	5
	17	17	17

<b>Junior</b>			
	<b>F</b>	<b>W</b>	<b>S</b>
AM 250 Computer Application to Agriculture (F.1.) .....			3
AM 321 Farm Records .....	4		
BIO 303 Genetics (B.1.b.) .....	3		
CHEM 328 Biochemistry (B.1.a.) .....		4	
CRSC 311 Applied Insect Pest Management .....	4		
CRSC 411 Experimental Techniques and Analysis .....			4
PSY 202 General Psychology (E.1.) .....	3		
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>2</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		6	
<sup>1</sup> Electives .....		5	6
	17	15	16
<b>Senior</b>			
FRSC 332 Fruit Plant Propagation .....			4
FRSC 421 Advanced Pomology .....	4		
CRSC 304 Plant Breeding .....	4		
CRSC 461, CRSC 462 Senior Project .....	2	3	
CRSC 463 Undergraduate Seminar .....			2
VGSC 230 General Vegetable Crops or CRSC 230 General Field Crops .....		4	
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
Agricultural Management elective (300-400 level) .....		4	
<sup>2</sup> Critical reading electives (C.1.) .....	3	3	
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>1</sup> Elective .....			1
	16	17	16

<sup>1</sup> At least 12 units to be selected with the approval of the adviser from 300-400 level courses.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

## PLANT PROTECTION MINOR

This program emphasizes both plant protection and crop production. Within the plant protection field of study, the student will be exposed to a broad range of pest management subjects including economic entomology, plant pathology, weed control and vertebrate pest control. Within the production area the student may emphasize either fruit production, crop production, ornamental horticulture, or natural resource management.

## CURRICULUM FOR PLANT PROTECTION MINOR

Units

Required courses ..... 12

- BOT 325 Plant Nematology (4)
- CRSC 305 Advanced Weed Science (4)
- CRSC 327 Vertebrate Pest Management (4)

Courses in area of emphasis ..... 16

Students must select an emphasis based on their major (either plant production or non-plant production). For purposes of this minor plant production majors include Crop Science, Fruit Science, Natural Resources Management (Forestry Option) and Ornamental Horticulture.

### *Emphasis for Plant Production Majors*

- I. ENT 220 Agricultural Entomology (4) or  
ENT 326 General Entomology (4)
- II. Select three of the following (courses used to fulfill requirements for the major cannot also be counted for the minor):
  - BOT 323 Plant Pathology (4)
  - BOT 431 Advanced Plant Pathology (4)
  - CRSC 221 Weed Control (4)
  - CRSC 311 Applied Insect Pest Management (4)
  - CRSC 321 Advanced Insect Pest Management (4)

### *Emphasis for Non-Plant Production Majors*

- I. Select one of the groups below for 12 units:
  - CRSC 131 Introduction to Crop Science (4)
  - CRSC 132 Grain Crops (4)
  - CRSC 421 Oil and Fiber Crops (4)
  - FRSC 131 Pomology (4)
  - FRSC 231 Viticulture (4)
  - FRSC 331 Advanced Viticulture (4)
  - CRSC 131 Introduction to Crop Science (4)
  - VGSC 232 Vegetable Crops Production (4)
  - VGSC 326 Advanced Vegetable Production (4)
  - OH 131 Fundamentals of Ornamental Horticulture I (4)
  - OH 133 Plant Propagation, Fundamentals III (4) or
  - OH 243 Turf Management (4)
  - OH 324 Foliage Plant Culture (4) or
  - OH 424 Wholesale Nursery Management (4)
  - FOR 208 Dendrology (4)
  - FOR 303 Forest Protection (4)
  - FOR 407 Silviculture (4)
- II. Select one of the following courses:
  - BOT 323 Plant Pathology (4)
  - CRSC 321 Advanced Insect Pest Management (4)
  - ENT 220 Agricultural Entomology (4)
  - ENT 326 General Entomology (4)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Crop Science, Fruit Science, Vegetable Science and other subjects.

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## DAIRY SCIENCE DEPARTMENT

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### Faculty

**Department Head, Eugene E. Starkey**

Leslie S. Ferreira  
Timothy J. LaSalle

Gary D. Reif  
Herman E. Rickard

### Programs

B.S. Dairy Science with Options in:

Dairy Husbandry

Dairy Products Technology

The Bachelor of Science degree in Dairy Science is designed to prepare students for employment in the various phases of the dairy industry, including husbandry and dairy products technology, as well as the related and allied fields. The basic curriculum is arranged to serve all students within the major with further courses included in the two options of husbandry and dairy products technology to provide depth of instruction in either field.

The curriculum provides adequate elective units to complete a minor or select additional courses in various areas of your choice. Recommendations are available from faculty advisers.

Excellent facilities are provided for students selecting either of the options. The dairy herd includes purebred Jerseys, Guernseys, and Holsteins, located on a well-planned unit, where feeding, milking, calf raising, artificial insemination, and management are carried out. The campus creamery is a new and modern plant, well equipped with modern processing equipment. Students are employed on a part-time basis to work in both the production and processing areas. A separate dairy located on campus provides an opportunity for students with dairy projects. This farm accommodates 80-100 head of project cattle owned and cared for by students. There are two, six-unit dormitories at this project farm.

### CURRICULAR OPTIONS

#### Dairy Husbandry

The Dairy Husbandry Option emphasizes the preparation of students in production and management areas of the industry, including the selection, management, feeding and breeding of dairy cattle, and efficient, economical milk production.

#### Dairy Products Technology

The Dairy Products Technology Option emphasizes preparation for participation in the processing and distribution field, including sales, quality control, field work and dairy inspection.

**CURRICULUM IN DAIRY SCIENCE**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
DH 101 Dairy Feeds and Feeding .....	2		
DH 102 Feeding Dairy Cattle .....		2	
DH 121 Elements of Dairying .....	4		
DPT 133 Milk Processing and Merchandising .....			4
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2
BOT 121 General Botany .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ZOO 131 General Zoology (B.1.b.) .....		4	
<sup>1</sup> Mathematics electives (B.2.) .....		3	3
<sup>2</sup> Restricted elective .....			2
Electives and courses to complete major .....	3	5	5
	17	17	16
<b>Sophomore</b>			
DH 221 Milk Production .....	4		
DPT 134 Dairy Processing Technology .....		4	
ACTG 211 Financial Accounting .....	4		
BACT 221 General Bacteriology (B.1.b.) .....	4		
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
PSY 202 General Psychology (E.1.) .....			3
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Computer literacy elective (F.1.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
<sup>1</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....	3		3
Electives and courses to complete major .....		3	5
	18	16	17
<b>Junior</b>			
DPT 332 Dairy Inspection .....			3
DPT 333 Dairy Foods Evaluation .....			2
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry (B.1.a.) .....			4
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
POLS 210 American and California Government (D.1.) .....	3		
PHYS 104 Introductory Physics or			
PHYS 121 College Physics .....	4		
Electives and courses to complete major .....	6	12	3
	17	16	16
<b>Senior</b>			
DH 461, DH 462 Senior Project .....	2	2	
DH 463 Undergraduate Seminar .....			2
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
CHEM 328 Biochemistry .....	4		
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
Electives and courses to complete major .....	7	8	8
	16	16	16

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> To be selected with adviser's approval.



**DAIRY HUSBANDRY OPTION**

(Add courses below to basic curriculum)

**Freshman**

DH 142 Dairy Cattle Selection ..... (2)

SS 121 Introductory Soil Science ..... (4)

**Sophomore**DH 222 Commercial Dairy Herd  
Management ..... (4)

VS 123 Anatomy and Physiology ..... (3)

VS 302 Animal Hygiene ..... (3)

**Junior**DH 301 Advanced Dairy Cattle  
Feeding ..... (3)DH 323 Breeds, Pedigrees and  
Management ..... (4)

DH 330 Artificial Insemination ..... (2)

BIO 303 Genetics ..... (3)

**Senior**DH 422 Breeding and Selection of  
Dairy Cattle ..... (4)

AM 212 Agricultural Economics ..... (3)

ASCI 402 Animal Nutrition ..... (4)

**DAIRY PRODUCTS TECHNOLOGY OPTION**

(Add courses below to basic curriculum)

**Freshman**

DPT 222 Frozen Dairy Foods ..... (4)

**Sophomore**

DPT 336 Butter and Dairy Spreads ..... (4)

BACT 322 Dairy Bacteriology ..... (4)

**Junior**

DPT 326 Fermented Dairy Foods ..... (3)

DPT 331 Condensed and Dry Milk ..... (4)

DPT 334 Cheese ..... (4)

Management elective ..... (3)

**Senior**DPT 433 Dairy Plant Management and  
Equipment ..... (4)

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## FOOD SCIENCE AND NUTRITION DEPARTMENT

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### Faculty

#### Department Head, Robert D. Vance

Sarah E. Burroughs  
Norman R. Eggen  
Joseph Montecalvo, Jr.

Krishnakumar S. Morey  
O. Robert Noyes  
Mary E. Pedersen

Patricia A. Saam  
Mary Y. Wang  
Rudy A. Wooten

### Programs

B.S. Dietetics and Food Administration      B.S. Food Science

The Food Science and Nutrition Department offers two degrees designed to prepare graduates for employment in the general areas of human nutrition and commercial food processing. Graduates in Dietetics and Food Administration find rewarding health service careers in hospitals, business, industrial plants, government institutions and education. Food Science graduates take responsible jobs in commercial food processing and manufacturing, sales, services and government regulation. Opportunities for private consulting and business are available to graduates in both majors, depending on personal interests and initiative.

The department has laboratories and pilot plant facilities for teaching courses in nutrition, food management, fruit and vegetable processing and meat processing. Classroom and laboratory instruction is personalized as much as possible, and faculty adhere to the university's learn-by-doing philosophy. Through the student enterprise program, students can manufacture and market various food products. Enterprise projects are designed to simulate industry and business practices. Students are further encouraged to gain industry experience by working during the summer months or by participating in one the university co-op or internship programs.

There are two departmental clubs—Dietetics and Food Science. Club activities involve a wide range of social, professional and service projects. Clubs provide opportunity for leadership training and participation in professional societies and organizations.

### DIETETICS AND FOOD ADMINISTRATION MAJOR

The Dietetics and Food Administration curriculum prepares graduates for careers in various areas of nutrition, dietetics, and food administration. The Bachelor of Science degree in Dietetics and Food Administration fulfills the academic requirements for eligibility for admission to a dietetic internship or equivalency which must be completed before qualifying for registration as a dietitian with the American Dietetic Association. Hospitals, educational institutions, governmental agencies, and industry employ graduates with positions in food systems management, nutrition services and education. Graduates are also prepared to pursue advanced degrees in nutrition, foods, dietetics, public health and institution management.

**CURRICULUM IN DIETETICS AND FOOD ADMINISTRATION**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
DFA 121 Fundamentals of Food .....			4
DFA 210 Nutrition (E.2.) .....		3	
ANT 201 Cultural Anthropology .....			3
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
ECON 201 Survey of Economics (D.3.) .....			3
ENGL 114 Writing: Exposition (A.1.) .....		4	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
MATH 114 College Algebra (B.2.) .....	3		
POLS 210 American and California Government (D.1.) .....	3		
SOC 105 Introduction to Sociology (D.4.a.) .....	3		
Electives .....	3	4	3
	16	15	16
<b>Sophomore</b>			
FDSC 209 Meat Procurement and Use .....		3	
ACTG 221, ACTG 222 Financial Accounting I and II .....		4	4
BACT 221 General Bacteriology .....			4
ZOO 131 General Zoology (B.1.b.) .....		4	
CHEM 326 Survey of Organic Chemistry .....			4
FDSC 230 Elements of Food Processing .....	4		
CSC 110 Computers and Computing or			
AM 250 Computer Application to Agriculture (F.1.) .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
MGT 206 Principles of Purchasing .....	3		
PSY 201/PSY 202 General Psychology (E.1.) .....			3
SPC 202 Principles of Speech (A.3.) .....		3	
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
Elective .....	2		
	16	17	18
<b>Junior</b>			
DFA 310 Maternal and Child Nutrition .....	3		
DFA 315 Geriatric Nutrition .....		3	
DFA 321 Meal Management .....	3		
DFA 328 Advanced Nutrition .....			4
CHEM 328 Biochemistry .....	4		
ED 305 Teaching and Learning Processes .....		3	
MGT 313 Industrial Relations .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
PSY 302 Behavior in Organizations .....	3		
ZOO 237 Human Anatomy .....	3		
ZOO 300 Human Physiology .....		5	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
Electives .....			6
	16	17	16

Senior		F	W	S
DFA 348	Experimental Nutrition .....	2		
DFA 415	Methods of Teaching Nutrition .....	3		
DFA 416	Community Nutrition .....		3	
DFA 421	Cultural and Aesthetic Aspects of Food .....			3
DFA 425	Quantity Food Preparation .....	3		
DFA 426	Food Systems Management .....		3	
DFA 427	Equipment and Layout .....			3
DFA 429	Diet Therapy .....	4		
DFA 461, DFA 462	Senior Project .....		3	3
FDSC 463	Undergraduate Seminar .....		2	
BACT 421	Food Microbiology .....	4		
HIST 315	Modern World History (D.2.) .....	3		
<sup>1</sup>	Critical reading electives (C.1.) .....		6	
<sup>1</sup>	Literature, philosophy, arts electives (300-400 level) (C.3.) .....			6
		19	17	15

<sup>1</sup>To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)



## FOOD SCIENCE MAJOR

The Bachelor of Science degree in Food Science is designed to prepare students for employment in the commercial food processing industry. Principal areas of instruction are in fruit and vegetable processing, cereal and snack food manufacture and red meat processing. Instruction qualifies graduates for careers in line production, quality control, food technology, marketing and management. The curriculum is approved by and is in compliance with minimum standards established by the Institute of Food Technologists, an international scientific society.

## CURRICULUM IN FOOD SCIENCE

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
FDSC 122 Introductory Food Engineering .....	4		
FDSC 150 Processed Food Inspection .....		3	
FDSC 209 Meat Procurement and Use or			
FDSC 210 Meats .....	3		
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....		4	4
DFA 210 Nutrition (E.2.) .....	3		
DPT 230 General Dairy Manufacturing .....		4	
ENGL 114 Writing: Exposition (A.1.) .....		4	
PSY 201 General Psychology (E.1.) .....	3		
PHYS 104 Introductory Physics .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
MATH 114 College Algebra (B.2.) .....	3		
<sup>1</sup> Mathematics or statistics elective (B.2.) .....		3	
<sup>2</sup> Plant science elective .....			4
	<hr/> 16	<hr/> 18	<hr/> 15
<b>Sophomore</b>			
FDSC 241, FDSC 243, FDSC 245 Unit Processing Operations .....	4	4	3
FDSC 247 Unit Processing Operations .....		4	
BACT 221 General Bacteriology (B.1.b.) .....	4		
CHEM 326 Survey of Organic Chemistry .....		4	
CHEM 328 Biochemistry (B.1.a.) .....			4
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
POLS 210 American and California Government (D.1.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
<sup>2</sup> Animal Science elective .....			4
<sup>1</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....		3	3
<sup>3</sup> Elective .....			3
	<hr/> 17	<hr/> 19	<hr/> 17

<b>Junior</b>		<b>F</b>	<b>W</b>	<b>S</b>
FDSC 321	Food Quality Control .....	3		
FDSC 331	Principles of Food Plant Sanitation .....	3		
FDSC 332	Statistical Quality Control .....		3	
FDSC 336	Food Packaging .....	3		
FDSC 338	Meat Processing .....		3	
FDSC 350	Advanced Food Engineering .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3	
AM 250	Computer Application to Agriculture (F.1.) .....			3
ECON 201	Survey of Economics or			
ECON 211	Principles of Economics (D.3.) .....	3		
HIST 315	Modern World History (D.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....				3
<sup>2</sup> Business electives .....			3	3
<sup>1</sup> Critical reading electives (C.1.) .....		3	3	
<sup>3</sup> Electives .....		2		2
		17	15	17
<b>Senior</b>				
FDSC 421	Advanced Food Processing .....	3		
FDSC 422	Food Composition Science .....		4	
FDSC 425	Sensory Evaluation of Food .....		3	
FDSC 431	Advanced Meats .....			3
FDSC 433	Food Processing Management .....			3
FDSC 461, FDSC 462	Senior Project .....	2	2	
FDSC 463	Undergraduate Seminar .....			2
BACT 421	Food Microbiology .....	4		
PHIL 230/PHIL 231	Philosophical Classics (C.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3	
<sup>3</sup> Electives .....		7	3	5
		16	15	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Dietetics and Food Administration, Food Science and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> Refer to departmental list of courses which satisfy Plant Science, Animal Science and Business electives.

<sup>3</sup> 6 of these elective units must be chosen from departmental list of approved electives (see adviser).

# NATURAL RESOURCES MANAGEMENT DEPARTMENT

## Faculty

**Department Head (Interim), Norman H. Pillsbury**

Michael T. Hanson  
John H. Harris  
Anthony E. Knable

Walter R. Mark  
Timothy G. O'Keefe  
Douglas D. Piirto

Timothy R. Plumb  
James R. Vilkitis

## Programs

**B.S. Natural Resources Management**

with Options in:

Forest Resources–Watershed,  
Chaparral, and Fire  
Management

Forest Resources–Urban Forestry  
Forest Resources–Management

with Concentrations in:

Environmental Management  
Parks and Forest Recreation

The Bachelor of Science degree program in Natural Resources Management prepares students for important careers in the protection, management, and development of our forest and natural resources. The forest and natural resources management program at Cal Poly prepares students for professional positions in the field of forestry, forest resources and natural resources management. Students may elect to emphasize important forest and land management disciplines, such as recreation management; urban forestry; environmental management; watershed, chaparral and fire management; hardwood management; fish and wildlife management.

Graduates qualify for such positions as Forester, Environmental Interpreter, Urban Forester, Environmental Specialist, Park Administrator, Resource Manager, Park Ranger, Resource Planner, Watershed Manager, and Fire Management Specialist.

Cal Poly graduates are employed throughout the world: establishing, managing and regenerating forests and urban wildland areas; providing opportunities for recreation use of forests; teaching; extension; research; harvesting forest crops; developing, processing and marketing wood products; and protecting the environment.

Cal Poly provides the practical and analytical skills to meet the demands of tomorrow and helps students develop a strong foundation in forest and natural resources management principles.

Forest and natural resources facilities provide the development of field skills. Special campus sites are used, such as: Christmas tree plantations, weather station, greenhouses, woodlots, biomass energy plantations, logging competition arena, experimental watershed and reservoirs. The 70-acre Atlee School Forest and nearby private resource areas, regional and State parks, and National Forests provide opportunities for practical field experiences.

The curriculum in Natural Resources Management provides a full range of courses in the humanities and the basic sciences and requires the completion of a concentration or option in a field of specialization to meet professional and employment requirements. Pregraduation employment in a natural resources area and internships reinforce classroom and laboratory experiences, and enhance opportunities for postgraduate student employment.

## CURRICULAR OPTIONS

The forest resources options prepare students for entry into the profession of forestry. Students are able immediately to apply forest management principles learned at Cal Poly. The curriculum provides broad training in forest resource management with emphasis in urban forestry; watershed, chaparral and fire management; hardwood management; and wood energy systems. Extensive field training occurs concurrently with classroom instruction. Also, employment as a forester with the Federal Government is recognized by the U.S. Office of Personnel Management.

### **Forest Resources–Watershed, Chaparral and Fire Management**

Students examine all aspects of water resource management in various forest ecosystems. The effects of watershed and fire management practices in chaparral and other Mediterranean-type ecosystems are studied in particular.

### **Forest Resources–Urban Forestry**

Management problems resulting from the continued trend of urbanization into the urban-wildland interface are studied. Urban Forestry focuses on the urban ecosystem including lesser vegetation, wildlife, and open space, as well as the trees. The curriculum emphasizes the application of forestry skills for management of urban forest ecosystems.

### **Forest Resources–Management**

Specialized areas of study are available through an emphasis in Hardwood Management or Wood Energy.

Individualized studies are also available in: agroforestry, environmental studies, fish–wildlife management, parks and outdoor recreation, computer science, journalism, business administration, Spanish, and marketing.

*Hardwood Management:* The protection, utilization, and regeneration of hardwood communities as well as the principles of hardwood management that are necessary to meet the rising demand for the multiple use of hardwood forests and oak woodlands are studied.

*Wood Energy:* This emphasis prepares students to design, implement, manage, evaluate and measure the energy yield of woody biomass energy systems. Topics of study include harvesting, utilization, combustion and conversion processes. Utilization of residue from commercial forestry operations is included.

## CURRICULAR CONCENTRATIONS

### **Environmental Management**

The environmental management concentration prepares students for employment as professionals in the fields of resource planning, environmental impact assessment and evaluation, and environmental policy analysis. Individual student programs are developed.

### **Parks and Forest Recreation**

The parks and forest recreation concentration prepares students for employment in the planning, interpretation, development, and management of governmental and private resource-based parks and other recreational lands.

## OTHER CONCENTRATIONS AVAILABLE

The fisheries and wildlife concentration offered by the Biological Sciences Department is available to Natural Resource Management majors and prepares students for employment in the fish and wildlife areas of law enforcement, management, and production. See concentration description in Biological Sciences for curricular requirements (page 332).



# CURRICULUM IN NATURAL RESOURCES MANAGEMENT

Freshman	F	W	S
FOR 201 Forest Resources .....	3		
FOR 205 Fire Ecology .....			3
SS 121 Introductory Soil Science.....			4
BOT 121 General Botany (B.1.b.) .....		4	
BOT 123 Introductory Plant Taxonomy .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 115 Trigonometry (B.2.) .....	3		
PE 250 Health Education (E.2.) .....			2
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>2</sup> Option, concentration, or restricted elective courses .....		3	3
Electives.....	4	4	
	17	17	16
Sophomore			
FOR 208 Dendrology .....	4		
AE 237 Engineering Surveying .....		2	
AE 345 Photogrammetry.....			3
STAT 211 Elementary Probability and Statistics and			
STAT 212 Statistical Methods (B.2.) .....	3	3	
CSC 110 Computers and Computing (F.1.) .....		3	
CHEM 121 General Chemistry (B.1.a.) .....		4	
ECON 211 Principles of Economics (D.3.) .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PHYS 121 College Physics (B.1.a.) .....			4
POLS 210 American and California Government (D.1.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
<sup>2</sup> Option, concentration, or restricted elective courses .....		2	
	16	17	17
Junior			
FOR 303 Forest Protection.....		4	
FOR 305 Forest Harvesting .....			4
FOR 314 Forest Mensuration .....	5		
FOR 316 Growth and Yield.....		3	
NRM 302 Natural Resources Policy .....	3		
NRM 304 Ecology of Resource Areas .....		4	
NRM 406 Natural Resources Administration .....			4
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
<sup>2</sup> Option, concentration, or restricted elective courses .....		3	3
CSC 207 BASIC Programming or			
College calculus .....	3		
	17	17	17

Senior		F	W	S
FOR 407	Silviculture .....	4		
FOR 415	Forest Valuation .....		3	
FOR 417	Forest Resource Management .....			4
FOR 440	Watershed Management .....			4
NRM 401	Natural Resource Economics .....		3	
FOR 461/NRM 461	Senior Project .....	2		
<sup>2</sup>	Option, concentration, or restricted elective courses .....	9	6	9
<sup>1</sup>	Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
		15	15	17

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> Courses to be chosen with the approval of the adviser, including 28 units in a concentration or 38 units in an option.

## FOREST RESOURCES-URBAN FORESTRY OPTION

(Add courses below to basic curriculum)

FOR 350	Community Forestry .....	(3)	CRP 360	Urban Aesthetics .....	(3)
FOR 450	Urban Forestry .....	(3)	MGT 201	Principles of Management ....	(3)
FOR 325	Woodlot Management .....	(3)	OH 134	Landscape Maintenance .....	(3)
FOR 333	Hardwood Management .....	(3)	OH 421	Arboriculture .....	(4)
NRM 112 or FOR 120	.....	(3)	SOC 313	Urban Sociology .....	(3)
NRM 311	Environmental Interpretation	(4)	Electives (NRM 203 recommended)	.....	(3)

## FOREST RESOURCES-WATERSHED, CHAPARRAL, AND FIRE MANAGEMENT OPTION

(Add courses below to basic curriculum)

FOR 204	Resource Fire Control .....	(2)	FOR 442	Watershed Protection .....	(3)
FOR 250	Survey and Management of Mediterranean Ecosystems.....	(2)	FOR 350 or FOR 450	.....	(3)
FOR 340	Resource Fire Management ....	(2)	AE 445	Remote Sensing .....	(3)
FOR 345	Chaparral Management .....	(3)	SS 440	Forest and Range Soils .....	(4)
FOR 441	Forest and Range Hydrology	(3)	STAT 324	Applied Regression Analysis	(3)
			Electives (SS 433 Land Use Planning recommended)	.....	(10)

## FOREST RESOURCES-MANAGEMENT OPTION

(Add courses below to basic curriculum)

Students may select courses in an area of emphasis such as hardwood management or wood energy.

FOR 325	Woodlot Management .....	(3)	FOR 350 or FOR 450	.....	(3)
FOR 332	Forest Products .....	(3)	FOR 434	Tree Growth and Wood Prop- erties .....	(3)
FOR 333	Hardwood Management .....	(3)	FOR 438	Wood Energy Systems I .....	(3)
FOR 345	Chaparral Management.....	(3)			

See COURSES OF INSTRUCTION section of this catalog for description of courses in Natural Resources Management, Forest Resources and other subjects.

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## ORNAMENTAL HORTICULTURE DEPARTMENT

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### Faculty

#### Department Head, Ronald D. Regan

Stephen F. Anglely  
 Patricia H. Breckenridge  
 Charlotte B. Burns  
 E. Wesley Conner  
 James A. D'Albro  
 Thomas E. Eltzroth

Winton H. Frey  
 Timothy A. Gaskin  
 Robert L. Gordon  
 David W. Hannings  
 Daniel E. Lassanske

William E. Noble  
 Marshall E. Ochylski  
 Robert P. Rice  
 Virginia R. Walter  
 Michael D. Zohns

### Programs

B.S. Ornamental Horticulture with Concentrations in:

Floriculture and Nursery Production      Landscape Industry  
 Horticulture Sales and Services

The Bachelor of Science degree in Ornamental Horticulture offers the student a comprehensive preparation for attractive positions in the nursery, greenhouse, landscape, and florist industries. This includes both the production and sales-service areas of these major fields. The curriculum stresses production and marketing of nursery plants, cut flowers, pot plants, and tropical foliage plants; landscape design, planting and supervision; and floral design and marketing.

Graduates of the Ornamental Horticulture Department qualify for management positions in nursery, greenhouse, and florist establishments, as well as supervisory positions in parks and grounds. Many of the graduates enter the field of teaching. Some of the most popular areas of employment include plant propagation, nursery sales, cut flower and pot plant production, greenhouse management; landscape design, construction, and maintenance management; the field of advising for fertilizer and pesticide companies; and floral design and floral shop management.

The facilities of the department include a student-operated commercial greenhouse range and nursery in which students carry on a project program involving wholesale and retail sales and a student-operated florist shop in which, in addition to plant sales, students design and sell floral pieces. Also included are 35,000 square feet of greenhouses, including a solar-heated house, 7,500 square feet of shadehouses, and an extensive field container growing area. Large, modern, well-equipped laboratories, including a tissue culture laboratory. In addition to 200 acres of landscaped campus, an arboretum is also utilized as an outdoor laboratory. The campus is planted with many interesting and unusual trees and shrubs from all over the world, as well as native plant materials.

Also available are the latest models of equipment necessary in nurseries, greenhouses, parks and grounds, landscaping, and florist shops. An extensive list of periodicals covering the field of ornamental horticulture is available to students. Through the staff, affiliation in several national and state horticultural organizations is maintained.

Students interested in the two-year technical certificate should refer to the introductory statement for the School of Agriculture which describes this program. Detailed curriculum information is available from the department head.

**CURRICULAR CONCENTRATIONS****Floriculture and Nursery Production**

This concentration is designed to educate and prepare the student for production and management in the floriculture and nursery industries.

**Horticulture Sales and Services**

This concentration is designed to educate the student in the business world as it relates to the specialized field of ornamental horticulture.

**Landscape Industry**

This concentration is designed to educate and prepare the student to be versatile in the fields of landscape design, installation and management.

**CURRICULUM IN ORNAMENTAL HORTICULTURE****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
OH 100 Orientation to Ornamental Horticulture .....	1		
OH 101 Principles of Landscape Design I .....	3		
OH 126 Ornamental Horticulture Construction .....		2	
OH 131, OH 132 Fundamentals of Ornamental Horticulture I, II .....	4	3	
OH 133 Plant Propagation, Fundamentals III .....			4
OH 134 Landscape Maintenance, Fundamentals IV.....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2
BOT 121 General Botany (B.1.b.) .....		4	
BOT 123 Introductory Plant Taxonomy (B.1.b.) .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
MATH 114 College Algebra (B.2.) .....	3		
MATH 115 Trigonometry or			
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
SS 121 Introductory Soil Science.....		4	
<sup>1</sup> Electives and courses to complete major .....	2		
	17	16	16

**Sophomore**

OH 250 Principles of Landscape Design II .....			3
OH 231, OH 232, OH 233 Plant Materials .....	4	4	4
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
ECON 201 Survey of Economics (D.3.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
ENT 220 Agricultural Entomology .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
SS 221 Fertilizers .....		4	
<sup>1</sup> Electives and courses to complete major .....	2	1	3
	17	16	17

**Junior**

	<b>F</b>	<b>W</b>	<b>S</b>
OH 327 Diseases and Pests of Ornamental Plants .....			4
ACTG 211 Financial Accounting for Non-Business Majors .....		4	
Computer literacy elective (F.1.) .....	3		
BOT 324 Ornamental and Forest Pathology .....	4		
BUS 201 Business Law Survey .....		3	
CHEM 326 Survey of Organic Chemistry .....		4	
POLS 210 American and California Government (D.1.) .....			3
Approved science elective .....			4
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>1</sup> Electives and courses to complete major .....	7	6	5
	17	17	16

**Senior**

OH 460 Senior Seminar .....	1		
OH 461, OH 462 Senior Project .....	2	2	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
BOT 322 Introductory Plant Physiology (B.1.b.) .....	4		
CRSC/FRSC/VGSC elective (200-400 level) .....		4	
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>2</sup> Critical reading electives (C.1.) .....	3		3
<sup>2</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....			6
<sup>1</sup> Electives and courses to complete major .....	3	1	5
	16	16	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Ornamental Horticulture and other subjects.

<sup>1</sup> Of the total elective units 26 must be chosen in a concentration with approval of the adviser with a minimum of 18 units at 300-400 level.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

## SOIL SCIENCE DEPARTMENT

### Faculty

#### Department Head, Brent G. Hallock

Gaston Amedee  
Delmar D. Dingus  
Royce L. Lambert

Curtis Dean Piper  
Thomas J. Rice, Jr.  
Thomas A. Ruehr

Terry L. Smith  
Ronald D. Taskey

### Programs

#### B.S. Soil Science

Three-fourths of the world's food supply and nearly all of its fiber come from the fragile, thin skin of the land's surface—the soil. Soil scientists are the most knowledgeable and best trained people responsible for the management of soil, one of our most precious natural resources. The Bachelor of Science degree in Soil Science prepares graduates for professional positions in farm advisement and management, the fertilizer industry, soil conservation, teaching, and international agricultural development. Students are also prepared for highly specialized positions in laboratory analysis and soil survey as well as for graduate studies.

Facilities of the department include laboratory, glasshouse, land and equipment to emphasize the practical application of classroom knowledge. The use of demonstration plots, agriculture internships, and the application of accepted cultural practices on the campus farm are among the methods of integrating the classroom with work experiences and careers.

Students majoring in soil science develop a broad background in the basic sciences. They are provided ample opportunities to apply the knowledge and skills learned to the practical solutions of agricultural problems. The students who select courses in soil science as electives will gain an appreciation for the importance of soil in fulfilling society's needs.

### CURRICULUM IN SOIL SCIENCE

#### Freshman

	F	W	S
SS 100 Orientation in Soil Science .....	1		
SS 121 Introductory Soil Science.....		4	
SS 122 Soil Management .....			4
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
Agriculture support elective (from approved list) .....			4
PE 250 Health Education (E.2.) .....		2	
BOT 121 General Botany (B.1.b.) .....			4
CHEM 127, CHEM 128 General Chemistry (B.1.a.) .....	4	4	
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
<sup>1</sup> Crop Science elective .....	4		
<sup>2</sup> Computer literacy elective (F.1.) .....			3
<sup>2</sup> Mathematics elective (B.2.) .....	3		
<sup>2</sup> Statistics elective (B.2.) .....		3	
	16	16	18

**Sophomore**

	<b>F</b>	<b>W</b>	<b>S</b>
SS 202 Soil Conservation .....		3	
SS 221 Fertilizers .....	4		
SS 223 Soil Materials .....	4		
CHEM 129 General Chemistry .....	4		
CHEM 326 Survey of Organic Chemistry .....		4	
CHEM 328 Biochemistry .....			4
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
PHYS 104 Introductory Physics or			
PHYS 121 College Physics .....			4
Ornamental Horticulture elective (from approved list) .....	4		
Electives .....			3
	<u>16</u>	<u>17</u>	<u>17</u>

**Junior**

SS 321 Soil Morphology .....	4		
SS 322 Soil Fertility .....		3	
AM 321 Farm Records or			
ACTG 211 Financial Accounting for Nonbusiness Majors .....	4		
AE 340 Irrigation Water Management or			
FOR 440 Watershed Management .....			4
BACT 221 General Bacteriology or			
BACT 224 General Microbiology (B.1.b.) .....	4		
HIST 315 Modern World History (D.2.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
Mathematics elective (from approved list) .....			4
Agriculture support elective (from approved list) .....		3	3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
BACT/BIO/BOT elective (300-400 level) .....		4	
<sup>2</sup> Critical reading electives (C.1.) .....	3		3
	<u>18</u>	<u>16</u>	<u>17</u>

**Senior**

SS 422 Soil Microbiology .....		3	
SS 423 Soil Chemistry .....			4
SS 432 Soil Physics .....	4		
SS 433 Land Use Planning .....		3	
SS 461, SS 462 Senior Project .....	1	4	
SS 463 Undergraduate Seminar .....			2
CRSC 411 Experimental Techniques and Analysis .....			4
Agriculture support elective .....			3
<sup>1</sup> AM/BUS/MGT elective (300-400 level) .....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>2</sup> Literature, philosophy, arts electives			
(3 units at 300-400 level) (C.3.) .....	3	3	
Electives .....	4		3
	<u>15</u>	<u>16</u>	<u>16</u>

See COURSES OF INSTRUCTION section of this catalog for description of courses in Soil Science and other subjects.

<sup>1</sup> Selected with approval of adviser.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)





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## School of Architecture and Environmental Design

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### Degree Programs

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B.S. City and Regional Planning .....	182
B.S. Construction Management .....	186
B.S. Landscape Architecture.....	188
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## SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN

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Gar Day Ding, Dean

K. Richard Zweifel, Associate Dean

The School of Architecture and Environmental Design offers a Bachelor of Architecture degree, and four bachelor of science degree programs: Architectural Engineering, City and Regional Planning, Construction Management and Landscape Architecture. The student is kept aware that all five of these programs have a common objective and that they are all aimed at the betterment of the human physical environment. These programs endeavor to give the student a set of social values, a technical background, and training which result in creative expressions that are effective both professionally and personally.

Two graduate programs are offered: the Master of Architecture and the Master of City and Regional Planning. These programs are designed for students interested in advanced professional studies.

The excellent school facilities include design laboratories, grading galleries, soils laboratory, stress laboratory, construction shop, project yard, instructional resource center, computer laboratories, multi-media laboratory, and photo presentation laboratory. An outlying area of 12 acres known as the "Canyon" is available for extensive experimental construction. The location of the campus between the great population centers of San Francisco and Los Angeles is ideal for environmental studies ranging from rural to large metropolitan complexes. There is a continual stream of visiting lecturers. Field trips are arranged to various parts of the State as required work. Additionally, the school offers several opportunities through departmentally sponsored programs for directed foreign study as a part of curricular offerings, in addition to regular participation in The California State University's International Programs in Denmark and Italy.

The school is a Member of the Association of Collegiate Schools of Architecture and maintains a Student Chapter of the American Institute of Architects and Scarab, the professional architectural fraternity. Likewise, student chapters of the American Planning Association, the Associated General Contractors, Structural Engineers of California, and the American Society of Landscape Architects are active and maintain liaison between the respective professional organizations and the school.

Students interested in pursuing one of the five undergraduate program offerings within the school should familiarize themselves with the appropriate curriculum flow chart, available through the University Admissions Office and the Student Services Coordinator. Special attention is directed to the strict sequencing of courses and prerequisite requirements. Students who plan to transfer from a California community college should schedule classes to maximize transfer units. Reference should be made to the "Articulation Agreement" located in the community college counseling center.

All student work submitted for course credit becomes school property and will be returned only at the discretion of the instructor.

# ARCHITECTURAL ENGINEERING DEPARTMENT

## Faculty

Department Head, David S. Hatcher

- Thomas J. Ballew  
Michael W. Botwin  
John W. Edmisten
- Jacob Feldman  
William R. Phillips
- Satwant S. Rihal  
James H. Withers

## Programs

### B.S. Architectural Engineering

The four-year program in Architectural Engineering leads to the Bachelor of Science degree and has its major emphasis in the structural engineering of buildings. Students are encouraged to develop aptitudes in science and mathematics for creative engineering accomplishments. Graduates of this program in general will seek professional registration as civil and structural engineers. The Architectural Engineering curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology (A.B.E.T.).

The curriculum prepares the student to enter the field of architectural engineering, structural engineering, and the technically oriented aspects of architecturally related fields. In addition, students are prepared to pursue graduate studies in the fields of structural engineering, structural mechanics, and foundation engineering.

## CURRICULUM IN ARCHITECTURAL ENGINEERING

Freshman	F	W	S
ARCH 102, ARCH 103 Environmental Design Fundamentals .....		2	2
ARCH 106 Materials of Construction .....			3
EDES 101 Introduction to Architecture and Environmental Design .....	2		
EDES 110 Descriptive Drawing .....		1	1
EDES 111 Introduction to Drawing and Perspective .....		3	
EDES 112 Basic Graphics .....			3
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
<sup>1</sup> PE 250 Health Education (E.2.) .....	2		
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
	18	17	17

**Sophomore**

	<b>F</b>	<b>W</b>	<b>S</b>
ARCE 221 Elementary Structures .....	3		
ARCE 222 Mechanics of Structural Members .....		3	
ARCE 223 Structural Analysis I .....			3
ARCE 301 Stress Analysis Laboratory .....			1
ARCH 231 Architectural Practice .....			3
ARCH 251, ARCH 252 Architectural Design Fundamentals .....	3	3	
EDES 250 Computer Applications (F.1.) .....		2	
CHEM 124 General Chemistry (B.1.a.) .....			4
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4) .....			4
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
PHYS 133 General Physics .....	4		
POLS 210 American and California Government (D.1.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
	<u>17</u>	<u>18</u>	<u>18</u>

**Junior**

ARCE 302 Structural Analysis II .....	3		
ARCE 303 Steel Design .....		3	
ARCE 304 Timber Design .....			3
ARCE 305 Masonry Design .....			2
ARCE 306 Matrix Analysis of Structures .....		3	
ARCE 361 Structural Computing Laboratory .....	3		
ARCE 362 Structural Systems Laboratory .....		3	
ARCE 363 Steel Design Laboratory .....			3
CM 415 Concrete Testing Laboratory .....			1
ARCE 421 Soil Mechanics .....			3
ARCH 317/ARCH 318/ARCH 319 elective (C.3.) .....			2
CSC 331 Numerical Linear Analysis .....	3		
EE 201 Electrical Circuit Theory .....	3		
GEOL 201 Physical Geology .....		3	
ME 302 Thermodynamics .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....	3	3	
<sup>2</sup> Life sciences elective (B.1.b.) .....	3		
<sup>2</sup> Literature, philosophy, arts elective (C.3.) (300 level) .....			4
	<u>18</u>	<u>18</u>	<u>18</u>

Senior	F	W	S
ARCE 225 Dynamics .....	3		
ARCE 422 Foundation Design .....	3		
CM 433 Economic Analysis for Engineers .....	2		
ARCE 444 Reinforced Concrete Design .....	4		
ARCE 445 Prestressed Concrete Design .....		4	
ARCE 446 Advanced Structural Systems .....			3
ARCE 451 Timber and Masonry Design Laboratory .....	3		
ARCE 452 Reinforced Concrete Design Laboratory .....		3	
ARCE 453 Projects Laboratory .....			3
ARCE 481 Structural Models Laboratory .....		1	
ARCE 482 Seismic Laboratory .....			1
ARCE 483 Seismic Design .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
HIST 315 Modern World History (D.2.) .....	3		
ME 341 Fluid Mechanics .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
Approved technical elective .....			3
	18	17	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Architectural Engineering and other subjects.

<sup>1</sup> Any course listed under Distribution Area E.2. may be substituted for PE 250.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.) Distribution Area C3 must include at least one course from ARCH 317, ARCH 318, or ARCH 319 and additional 4 units must be 300-400 level.



# ARCHITECTURE DEPARTMENT

## Faculty

**Department Head, W. Mike Martin**

Joseph C. Amanzio	Merrill C. Gaines	David Lord
Robert F. Asbury, Jr.	Donald P. Grant	Willard L. McGonagill
Sharad D. Atre	Kenneth L. Haggard	Sandra D. Miller
James R. Bagnall	Terry C. Hargrave	Sixto E. Moreira
Ronald E. Batterson	John E. Harrigan, Jr.	Paul R. Neel
David A. Brodie	George Hasslein	Raymond E. Nordquist
William H. Brown	Patrick D. Hill	Jens G. Pohl
Joseph B. Burton	George K. Ikenoyama	Charles W. Quinlan
Arthur J. Chapman	Brian B. Kesner	Kenneth E. Schwartz
Allan R. Cooper	Donald J. Koberg	Marcel E. Sedletzky
M. Polly Cooper	Kenneth M. Kohlen	Arthur H. Silvers
Robert S. Coppola	Sandra D. Lakeman	Vern Swansen
M. Bilgi Denel	John H. Lange	Don E. Swearingen
Donna P. Duerk	Larry H. Loh	Paul M. Wolff

## Programs

B.Arch. Architecture	M.Arch. Architecture
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The objective of the five-year Bachelor of Architecture degree program is to develop design and related skills necessary for entry into the professional field of architecture. Preparation for architecture spans several disciplines and requires a range of aptitudes. As the architect has a responsibility for solving problems of the built environment involving people, an understanding and sensitivity to human needs is required. Therefore, programs in architecture are broad in nature. With careful selection of elective work, areas of specialization can be included. Both the Bachelor of Architecture and the Master of Architecture degrees are accredited by the National Architectural Accrediting Board.

## CURRICULUM IN ARCHITECTURE

1st Year	F	W	S
ARCH 102, ARCH 103 Environmental Design Fundamentals .....		2	2
ARCH 106 Materials of Construction .....			3
EDES 101 Introduction to Architecture and Environmental Design .....	2		
EDES 110 Descriptive Drawing .....		1	1
EDES 111 Introduction to Drawing and Perspective .....	3		
EDES 112 Basic Graphics .....		3	
AE 237 Engineering Surveying .....	2		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4) .....			4
MATH 141, MATH 142 Analytic Geometry and Calculus (B.2.) .....	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
POLS 210 American and California Government (D.1.) .....	3		
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
	18	17	17

**2nd Year**

	F	W	S
ARCE 221 Elementary Structures .....	3		
ARCE 222 Mechanics of Structural Members .....		3	
ARCE 223 Structural Analysis I .....			3
ARCH 217, ARCH 218, ARCH 219 History of Architecture .....	2	2	2
ARCH 221 Introduction to Environmental Design Science .....			2
ARCH 231, ARCH 232 Architectural Practice .....		3	3
ARCH 251, ARCH 252, ARCH 253 Architectural Design Fundamentals .....	3	3	3
EDES 250 Computer Applications (F.I.) .....		2	
EDES 251 Digital Computer Applications .....		1	
LA 213 Site and Terrain Analysis.....			3
PHYS 137 General Physics .....	4		
<sup>1</sup> Approved design process elective .....		3	
<sup>1</sup> Approved design theory elective .....	3		
Approved graphics elective .....	2		
	17	17	16

**3rd Year**

ARCE 301 Stress Analysis Laboratory .....	1		
ARCE 321 Timber Design .....	3		
ARCE 322 Steel Design .....		3	
ARCE 323 Concrete and Masonry Design .....			3
ARCH 307, ARCH 308, ARCH 309 Building Support Systems .....	2	2	2
ARCH 317, ARCH 318, ARCH 319 History of Architecture .....	2	2	2
ARCH 341, ARCH 342, ARCH 343 Architectural Practice .....	2	2	2
ARCH 351, ARCH 352, ARCH 353 Architectural Design .....	5	5	5
CRP 212 Introduction to Urban Planning .....		3	
<sup>1</sup> Approved design graphics elective .....			2
<sup>1</sup> Approved human factors elective .....	3		
	18	17	16

**4th Year**

ARCH 407 Building Support Systems .....	2		
ARCH 441, ARCH 442, ARCH 443 Professional Practice .....	2	2	2
ARCH 451, ARCH 452, ARCH 453 Architectural Design .....	5	5	5
ARCH 463 Undergraduate Seminar .....			2
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....		2	
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
HIST 315 Modern World History (D.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
<sup>1</sup> Approved design urban/contextual elective.....		3	
<sup>1</sup> Approved school professional electives .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>2</sup> Critical reading-English (C.1.) .....		3	
	18	18	18

5th Year	F	W	S
ARCH 481 Architectural Design .....	5	5	5
ARCH 491, ARCH 492, ARCH 493 Design Project .....	2	2	2
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
<sup>1</sup> Approved school professional electives .....		3	3
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
<sup>2</sup> Critical reading elective (C.1.) .....	3		
<sup>2</sup> Life sciences elective (B.1.b.) .....	3		
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
	16	16	16

<sup>1</sup> To be selected with department approval.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see Page 98 of this catalog.)

## MASTER OF ARCHITECTURE

### General Characteristics

The Master of Architecture degree is accredited by the National Architectural Accrediting Board and fulfills the formal educational preparation for registration as an architect for those students not already holding an accredited degree in architecture. Applicants may enter at one of two levels: The first is designed for applicants having attained an National Architectural Accrediting Board (NAAB) accredited five-year Bachelor of Architecture degree and can be completed in one year (three academic quarters); the second is designed for applicants having attained a four-year BA or BS degree in Architecture or Environmental Design and will require a minimum of two years (six academic quarters) depending on preparation.

Program resources are drawn from the faculty and facilities of a large, diversely balanced, and technically-oriented school. Well-equipped studios, shops, testing laboratories, computer facilities and an extensive construction site exist for experimental use. Study options are individualized to meet the educational needs of accepted applicants. Preference is extended to those applicants whose formal program of study proposals are most clearly translated into achievable goals and objectives.

### Prerequisites

The Graduate Program Coordinator reviews applications in terms of the following requirements:

1. Baccalaureate degree. Students with four-year degrees in Architecture or Environmental Design will be admitted as conditionally classified students and may be advanced to classified status when course work equivalent to a B.Arch. degree is completed.
2. 3.0 overall undergraduate grade point average
3. Submission of formal program of study
4. Comprehensive portfolio of architectural work
5. Letters of Reference (3)

Note: Foreign student applicants are also required to submit TOEFL scores of above 560 and meet university requirements stated on page 116 of this catalog.



## CURRICULUM FOR THE MASTER OF ARCHITECTURE DEGREE

### Program One

For candidates with an NAAB Accredited Bachelor of Architecture Degree:

Required courses: .....	Units 27
ARCH 519 Theory of Architecture (3)	
ARCH 532 Quantitative Methods of Architecture (3)	
ARCE 521 Architectural Structures (3)	
ARCH 561 Advanced Design (3) (3) (3)	
ARCH 598 Master's Design Project (3) (3) (3) or	
ARCH 599 Master's Thesis (3) (3) (3)	
Approved Professional Electives (400 or 500 level) .....	9
Approved Supportive Electives (to be selected with adviser's approval) .....	9
	45

### Program Two

Applicants with four-year Architecture or Environmental Design degree:

Required courses: .....	Units 42
ARCH 519 Theory of Architecture (3)	
ARCH 532 Quantitative Methods in Architecture (3)	
ARCE 521 Architectural Structures (3)	
ARCH 551 Architectural Design (5) (5) (5)	
ARCH 561 Advanced Design (3) (3) (3)	
ARCH 598 Master's Design Project (3) (3) (3) or	
ARCH 599 Master's Thesis (3) (3) (3)	
Approved Professional Electives (400 or 500 level) .....	15
Approved Supportive Electives (to be selected with adviser's approval) .....	15
	72

For further information contact the Graduate Program Coordinator, Architecture Department, School of Architecture and Environmental Design, Cal Poly, San Luis Obispo, CA 93407.

See COURSES OF INSTRUCTION section of this catalog for description of courses in Architecture and other subjects.

## CITY AND REGIONAL PLANNING DEPARTMENT

### Faculty

#### Department Head, William A. Howard

Linda C. Dalton  
Steven P. French

Leo Jakobson  
Joseph M. Kourakis

Michael E. McDougall  
Edward J. Ward

### Programs

B.S. City and Regional Planning

M.C.R.P. City and Regional Planning

The four-year curriculum leading to a Bachelor of Science degree in City and Regional Planning develops competency in technical skills directed toward the professional field which deals with urban and regional processes. The program emphasizes comprehensive physical planning and urban design supported by courses in technical, scientific, economic, legal, administrative, and social areas.

### CURRICULUM IN CITY AND REGIONAL PLANNING

Freshman	F	W	S
CRP 101 Introduction to the Profession of City and Regional Planning.....	1		
CRP 211 Introduction to Urbanization .....			3
EDES 101 Introduction to Architecture and Environmental Design .....	2		
EDES 110 Descriptive Drawing .....	1		
EDES 111 Introduction to Drawing and Perspective .....		3	
EDES 112 Basic Graphics .....			3
ANT 201 Cultural Anthropology or			
GEOG 150 Human Geography (D.4.a.) .....	3		
BIO 101 General Biology (B.1.b.) .....	3		
CSC 110 Computers and Computing (F.1.) .....			3
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
MATH 118 Pre-Calculus Algebra (B.2.) .....		4	
MATH 121 Finite Mathematics (B.2.) .....			3
PE 250 Health Education (E.2.) .....			2
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
SPC 201 Public Speaking (A.3.) .....			3
	17	16	17

#### Sophomore

CRP 203 Applied Design and Planning Fundamentals .....			3
CRP 212 Introduction to Urban Planning .....	3		
CRP 213 Survey Methods .....		3	
CRP 214 Urban and Regional Processes .....			3
CRP 216 Computer Applications for Planning .....			2
EDES 201, EDES 202 Environmental Design Fundamentals .....	3	3	

	F	W	S
ECON 221 Microeconomics .....	4		
ECON 222 Macroeconomics (D.3.) .....		4	
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
GEOL 211 Cities and Geology (B.1.a.) .....		3	
LA 213 Site and Terrain Analysis .....		4	
NRM 304 Ecology of Resource Areas .....			4
STAT 251 Statistical Inference for Management I (B.2.) .....	3		
<sup>1</sup> Critical reading-English (C.1.) .....			3
	17	17	15
<b>Junior</b>			
CRP 314 Planning Theory .....	3		
CRP 347, CRP 348 Urban and Regional Design .....	3		3
CRP 351, CRP 352, CRP 353 Planning Laboratory .....	4	4	4
POLS 210 American and California Government (D.1.) .....		3	
POLS 403 Municipal Government .....			3
SOC 313 Urban Sociology .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>1</sup> Critical reading elective (C.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....			3
<sup>1</sup> Physical or life sciences elective (B.1.) .....		3	
<sup>2</sup> Approved electives .....		4	4
	16	17	17
<b>Senior</b>			
CRP 409 Planning Internship .....			2
CRP 420 Planning Law .....	3		
CRP 430 Planning Administration .....		3	
CRP 447 Urban and Regional Design or			
CRP 452 Planning Lab .....		4	
CRP1, CRP 453 Planning Lab .....	4		4
CRP 461, CRP 462 Senior Project .....		2	2
ANT 360/ECON 304/GEOG 308 (D.4.b.) .....	3		
HIST 315 Modern World History (D.2.) .....			3
PHIL 315/PHIL 331/PHIL 333 (C.3.) .....	3		
MGT 317 Organizational Behavior or			
POLS 318 Administrative Theory and Behavior .....	4-3		
<sup>1</sup> Literature, philosophy, arts elective (C.3.) (300-400 level) .....		3	
<sup>2</sup> Approved electives .....		4	4
Elective .....	1-2		
	18	16	15

<sup>1</sup> To be selected in accordance with General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> To be selected with adviser approval and to include 9 units of CRP courses.

## MASTER OF CITY AND REGIONAL PLANNING

### General Characteristics

The Master of City and Regional Planning degree program (MCRP) is professionally oriented and is open to students with high standards of academic achievement who wish to pursue careers in city and regional planning. It is structured to prepare graduates with competence to function in a general and broad context of planning, as well as in a particular area of emphasis. The MCRP core courses cover planning theory, methods, law, formulation and implementation of plans and policies.

Two principal areas of study are emphasized: city planning for smaller urban areas, focused on comprehensive physical planning and urban design; and regional planning, focused on environmental systems and rural development. In addition, each student is expected to formulate an emphasis area within the resources of the university (i.e., natural resources management, transportation planning or regional landscape assessment). Other emphasis areas may be approved through consultation with the graduate adviser.

The master's program is structured to meet the needs of those who have earned baccalaureate degrees in a variety of disciplines including, but not limited to, economics, geography, architecture, landscape architecture, civil engineering, political science, environmental or urban studies, natural resources management, and ecology. The program is six quarters (two years) in duration and consists of 68 approved units (not including courses necessary to compensate for deficiencies). Because of the sequencing of courses, students admitted to the program are expected to begin their studies in the fall quarter. Students with prerequisite course work deficiencies and those with backgrounds allowing waivers of first-year core courses (maximum of 10 units) may be admitted in other quarters.

The MCRP Program offers students an opportunity to develop close working relationships with the planning faculty. Self-directed study, tailored to the student's interests and needs, is also encouraged.

### Prerequisites

Students entering the MCRP Program are expected to bring with them a background in certain basic subject areas or to make up deficiencies in these basic subject areas after admission. These include the following Cal Poly courses or their equivalents:

STAT 251	Statistical Inference for Management I
CSC 110	Computers and Computing

Applicants for admission to the Master of City and Regional Planning program are expected to:

1. Have earned a bachelor's degree from an accredited university or college
2. Have attained a grade point average of 3.0 in all undergraduate work
3. Provide the CRP Graduate Review Committee with the results of the Graduate Records Examination Aptitude Test
4. Give indications of motivation, maturity, and high standards of academic involvement through work and references (three letters required) and submission of a project or paper demonstrating writing ability
5. Provide a statement (maximum of 300 words) addressing your understanding of and areas of interest in city and regional planning, and your career objectives
6. Provide a statement (maximum of 300 words) addressing your educational objectives and the strengths and weaknesses of your preparation for graduate study.

Applicants lacking appropriate prerequisites or other appropriate background requirements for classified standing requirements may be admitted on a conditionally classified basis, depending on the results of an individual analysis of their applications.

## Emphasis Areas

### Natural Resources Management

This emphasis area links physical planning to concerns relating to natural resources management. The economics of resources, the administrative principles associated with these resources and the environmental impacts of resources management are covered within this emphasis area.

### Regional Landscape Assessment

The Regional Landscape Assessment emphasis area is directed toward an understanding of the relationships between land use activities and the natural systems within a region. The student will develop the analytical and technical knowledge and skills necessary to perform large scale resource assessment, modeling and planning. Various computer software packages will be utilized to file and aggregate data and evaluate planning strategies to their potential impact on existing developments and natural systems. The student should have a background in geomorphology, soils, ecology, and site and terrain analysis.

### Transportation Planning

This emphasis area is to prepare the student for understanding the principles of physical planning and how transportation systems relate. Within the emphasis, courses are directed toward the theory of transportation planning, the various systems of transport, and the economics of transportation.

## CURRICULUM FOR THE MASTER OF CITY AND REGIONAL PLANNING

	<i>Units</i>
Core Courses .....	51
CRP 409 Planning Internship (2)	
CRP 420 Planning Law (3)	
CRP 430 Planning Administration (3)	
CRP 501, CRP 502 Foundations of Urban and Regional Planning (4) (4)	
CRP 510 Planning Theory (4)	
CRP 513 Survey and Research Methods (3)	
CRP 515 Graphic Communication for Planners (3)	
CRP 516 Quantitative Methods in Planning (4)	
CRP 520 Feasibility Studies in Planning (3)	
CRP 552, CRP 553, CRP 555 Planning Laboratory (4) (4) (4)	
CRP 599 Thesis/Project (6)	
Approved Electives .....	17
<i>Natural Resources Management Emphasis (14 units):</i>	
NRM 401 Natural Resources Economics (3)	
NRM 403 Environmental Impact Analysis (3)	
NRM 409 Coastal Resource Management (4)	
<i>Regional Landscape Assessment Emphasis (13 units):</i>	
LA 410 Information Systems for Landscape Architecture (2)	
LA 411 Regional Landscape History (3)	
LA 551, LA 552 Regional Landscape Assessment (4) (4)	
<i>Transportation Planning Emphasis (15 units):</i>	
CE 424 Public Transportation (4)	
CE 523 Transportation Systems Planning (4)	
CRP 435 Transportation Theory (3)	
ECON 433 Transportation Economics (4)	

# CONSTRUCTION MANAGEMENT DEPARTMENT

## Faculty

Department Head, David R. Pierce, Jr.

James A. Rodger

Helmut I. Schleicher

Matthias R. Wall

## Programs

### B.S. Construction Management

The four-year program in Construction Management leads to the Bachelor of Science degree which is accredited by the American Council for Construction Education. Major emphasis is placed on organizing and managing the construction phase of society's efforts to improve the environment. The constructor is an important member of the building team and requires a professional knowledge of techniques, materials, equipment, job planning and costntrol to add to the contributions of the planning and design professions. Graduates of this program can help supply the urgent needs of the construction industry and its related fields.

### CURRICULUM IN CONSTRUCTION MANAGEMENT

#### Freshman

	F	W	S
ARCH 106 Materials of Construction .....			3
ARCH 121 Introduction to Architectural Graphics .....		3	
EDES 101 Introduction to Architecture and Environmental Design .....	2		
AE 237 Engineering Surveying .....	2		
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
BIO 220 Physiology and Biological Adaptation (B.1.b., E. 2.) ..			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
MATH 141, MATH 142 Analytic Geometry and Calculus (B.2.) .....	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
POLS 210 American and California Government (D.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
	15	17	17

#### Sophomore

ARCE 221 Elementary Structures .....	3		
ARCE 222 Mechanics of Structural Members .....		3	
ARCE 226 Structural Systems for Architects .....			3
ARCH 208, ARCH 209 Architectural Design Basics .....	2	2	
ARCH 231, ARCH 232 Architectural Practice .....	3	3	
CM 201 Introduction to Construction Management .....	3		
BUS 201 Business Law Survey .....	3		
CRP 212 Introduction to Urban Planning .....		3	
ECON 201 Survey of Economics (D.3.) .....		3	
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
ENGL 310 Corporate Communication .....			4

	F	W	S
LA 213 Site and Terrain Analysis.....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PHYS 137 General Physics: Applied Physics for Architects .....	4		
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
	18	18	16
<b>Junior</b>			
CM 321 Concrete Technology.....			3
CM 331 Construction Cost Control.....	3		
CM 332 Cost Alternatives Evaluation .....		4	
CM 333 Construction Contract Administration .....			3
CM 341 Wood and Masonry Construction Practices.....	3		
CM 342 Concrete and Formwork Construction Practices .....		3	
CM 343 Steel and Earthwork Construction Practices.....			3
CM 351, CM 352, CM 353 Building Support System Construction Practices .....	3	3	3
ARCE 301 Stress Analysis Laboratory .....	1		
ARCE 321 Timber Design.....	3		
ARCE 322 Steel Design.....		3	
ARCE 323 Concrete and Masonry Design .....			3
EDES 250 Computer Applications (F.1.) .....		2	
HIST 315 Modern World History (D.2.).....	3		
	16	15	15
<b>Senior</b>			
CM 441 Heavy and Civil Works Construction Practices .....	3		
CM 442 Building Estimating .....		2	
CM 443 Principles of Construction Management .....			3
CM 451 Industrial and Process Construction.....	4		
CM 452 Project Controls .....		4	
CM 453 Project Development.....			4
CM 461, 462 Senior Project.....	2	1	
ARCE 409 Survey of Foundation Engineering .....		3	
GEOL 201 Physical Geology (B.1.a.).....	3		
MGT 413 Labor Law.....		4	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
<sup>1</sup> Literature, philosophy, arts electives (300-400 level) (C.3.) .....	3		3
	18	17	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Construction Management and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

LANDSCAPE ARCHITECTURE DEPARTMENT

Faculty

Department Head, Gerald L. Smith

Jorg A. Bartels	John F. Gillham	Dale A. Sutliff
Walter D. Bremer	Alice C. Loh	Walter M. Tryon
Gary C. Dwyer	Roger J. Osbaldeston	K. Richard Zweifel

Programs

B.S. Landscape Architecture

The profession of landscape architecture is primarily involved with the design, planning, and protection of the natural and manmade environments. The the Bachelor of Science degree program in Landscape Architecture is accredited by the American Society of Landscape Architects and recognized by the California State Board of Landscape Architects.

An emphasis is placed on a process oriented approach to design and planning while developing an awareness and sensitivity to community and human values as they relate to environmental conditions. Students majoring in landscape architecture will acquire technical competencies and creative design skills through a range of projects which represent the breadth of the profession. Specialization may be elected through advisement in different areas. Please consult with departmental advisers for details.

Graduates of the program are prepared for positions in private practice, consulting, governmental agencies at the national, state or local levels, industry and construction firms. Graduate study is encouraged for those students interested in pursuing areas of specialization.

Majors who are in their last two years of study and have at least a 3.2 grade point average may have the opportunity to join Theta Chapter of Sigma Lambda Alpha, the national scholastic honor society for landscape architecture.

CURRICULUM IN LANDSCAPE ARCHITECTURE

Freshman	F	W	S
LA 110 Graphic Communication for Landscape Architects .....		3	
LA 152 Fundamentals of Design and Planning in Landscape Architecture .....		4	
EDES 101 Introduction to Architecture and Environmental Design .....	2		
EDES 112 Basic Graphics .....			3
BOT 121 General Botany (B.1.b.) .....		4	
CSC 110 Computers and Computing (F.1.) .....			3
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
HIST 204 History of American Ideals and Institutions (D.1.) ...			3
MATH 120 College Algebra and Trigonometry (B.2.) .....	5		
POLS 210 American and California Government (D.1.) .....	3		
PSY 201/PSY 202 General Psychology (E.1.) .....			3
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Mathematics or statistics elective (B.2.) .....			3
<sup>1</sup> Physical sciences elective (B.1.a.) .....		3	
	17	17	18



**Sophomore**

	F	W	S
LA 203 Applied Design and Planning Fundamentals .....			3
LA 231 Site and Terrain Analysis .....		4	
LA 231 Landscape Architecture Construction .....		3	
LA 310 Introduction to Computing in Planning and Design .....			2
LA 311 History of Landscape Architecture .....	3		
LA 341 Landscape Architecture Construction .....			3
EDES 201, EDES 202 Environmental Design Fundamentals .....	3	3	
AE 237 Engineering Surveying .....	2		
BOT 238 Native Plant Materials .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
OH 237, OH 238 Landscape Plants I, II .....	3	3	
AE 337 Landscape Irrigation.....			3
ANT 201/GEOG 150/SOC 105 (D.4.a.) .....			3
SS 121 Introductory Soil Science .....	4		
<sup>1</sup> Critical reading elective (C.1.) .....	3		
	18	17	17

**Junior**

LA 321 Concepts in Environmental Decision Making .....	3		
LA 342, LA 343 Landscape Architecture Construction .....		3	3
LA 347 Landscape Plant Composition .....	3		
LA 348 Advanced Landscape Plant Composition .....		3	
LA 351, LA 352, LA 353 Design for Landscape Architects .....	4	4	4
LA 410 Information Systems in Landscape Architecture .....			2
LA 441 Professional Practice .....		2	
ARCE 311 Structures for Landscape Architects .....	3		
CM 325 Construction Management Practices .....			3
CRP 212 Introduction to Urban Planning.....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
ANT 360 Human Cultural Adaptation (D.4.b.) .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2
	16	15	17

**Senior**

LA 442 Professional Practice .....	2		
LA 451, LA 452 Design for Landscape Architects.....	5	5	
LA 453 Advanced Landscape Architecture Design.....			5
LA 461 Senior Project.....		3	
LA 463 Undergraduate Seminar.....	2		
HIST 315 Modern World History (D.2.).....			3
<sup>2</sup> Adviser approved electives.....		3	3
PHIL 331 Ethics (C.3.).....	3		
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) (300-400 level) .....		3	
<sup>1</sup> Physical or life sciences elective (B.1.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
	15	17	14

See COURSES OF INSTRUCTION section of this catalog for description of courses in Landscape Architecture and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> To be selected with adviser approval.



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## School of Business

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### Degree Programs

B.S. Business Administration	
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Business Administration Department.....	197
Financial Management Concentration	
Marketing Management Concentration	
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International Business Management Concentration	
Management Concentration	
Management Information Systems Concentration	
Production and Operations Management Concentration	
B.S. Economics .....	200
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International Trade and Development Concentration	
Quantitative Economics Concentration	
M.B.A. Business Administration.....	192
Agribusiness Specialization	

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## SCHOOL OF BUSINESS

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Kenneth D. Walters, Dean  
M. Zafar Iqbal, Associate Dean

The primary objective of the School of Business is education for business administration. The school seeks to equip its majors with basic knowledge, analytical skills, and attitudes essential to employment in business, government, and other sectors in our society, and to serve students throughout the university by providing them with an understanding of the business world in which they live.

In pursuing these objectives, the school is committed to maintaining and improving upon the following:

- tradition of teaching excellence in the school;
- professional stature of the school faculty by stimulating research, publication and other professional development activities;
- faculty involvement in providing service to the university and community which enhances their teaching and research abilities.

The School of Business is accredited at the baccalaureate level by the American Assembly of Collegiate Schools of Business. The objective of accreditation is to foster high quality in education for business administration.

The school is organized into four departments—Accounting, Business Administration, Economics, and Management. This organization recognizes that education for business requires the interaction of business specialists with faculty in supporting disciplines to provide ability to function in the socio-economic environment in which business exists.

Programs leading to degrees of Bachelor of Science in Business Administration, Master of Business Administration, and Bachelor of Science in Economics are offered. A pre-law advisement service is available to all university students.

The school's educational philosophy follows the Cal Poly tradition—that of enlisting maximum student involvement in the learning process through career-oriented study, case analysis, special projects, internships, and computer applications. The school has its own computer lab facilities which are available to students to meet their coursework needs. Educational programs are designed to help the student achieve maximum personal development, to prepare the student for entry into the business world, and to foster citizenship, leadership, and constructive community living. The curriculum includes general education requirements and specialized studies in the student's major field. Optional areas of concentration within each major enable the student to select the program most closely suited to the chosen career field.

## MASTER OF BUSINESS ADMINISTRATION

### General Characteristics

The Cal Poly MBA program is designed to prepare students for careers in all phases of management. The program is broad in nature, requiring advanced study and research in most business disciplines. In addition, elective courses allow each student to specialize in one of those disciplines. The program is intended for students from a variety of undergraduate backgrounds. The primary goals of the program can be described as follows:

- To provide an integrated understanding of the principles of the various business disciplines.

Besides mastering the principles of the individual disciplines, the ability to integrate those principles is an essential characteristic of successful managers. Cal Poly's approach to MBA education is purposely aimed at fostering this integrated understanding.

- To develop an expertise in assembling and analyzing relevant facts as a basis for significant business decisions. The student will learn analytical, planning and forecasting skills to provide a basis for effective managerial decisions as firms adapt to their changing environment.
- To promote the ability to work with other people through an understanding of human values, motivations, and organizational structures. The student will understand the essential elements of interpersonal relations, individual and group behavior, and the design of effective organizations.

## Prerequisites

There are no specific prerequisite courses for the MBA program.

Admission to the MBA program is based upon:

- a) the student's undergraduate record, emphasizing most heavily the last 90 quarter units (or equivalent);
- b) achievement on the Graduate Management Admission Test (GMAT); and
- c) management potential as evidenced by previous work experience, community or college extracurricular activities, and evaluations by professors and/or supervisors.

For more information on the MBA Program and for application materials specific to the program, the interested student should communicate with the Director of the MBA Program.

## Program of Study

The MBA program entails a two-year program of graduate work. The purpose of the first year is to build a broad understanding of the concepts and principles of the field of business administration. At the end of the first year the student should have a firm knowledge of current business practices. In addition, the first year courses stress the fundamental theoretical concepts of the various business fields. The second year curriculum enables the student to integrate understanding of principles of various business disciplines and also to specialize in an area of interest by taking a cluster of carefully selected elective courses. About half the second year consists of elective classes, which allows students to take classes in their areas of interest. Satisfactory completion of a comprehensive examination is a requirement of the MBA program.

## Agribusiness Specialization

This specialization is offered in conjunction with the Agricultural Management Department. It requires the completion of six graduate courses taught by the Agricultural Management Department. These courses are taken in lieu of the electives in the MBA program. The MBA Agribusiness specialization is designed for those interested in agribusiness management careers. Graduates will be prepared for large farm and ranch management as well as for positions in supporting agribusiness industries such as commodity marketing or food processing.

**CURRICULUM FOR THE MASTER OF BUSINESS ADMINISTRATION***Units***FIRST YEAR**

Fall.....	16
GSB 511 Financial Accounting (4)	
GSB 512 Foundations for Quantitative Analysis (4)	
GSB 513 Organizations and Management (4)	
<sup>1</sup> GSB 514 Legal Aspects of Management and the Market System (4)	
Winter.....	16
GSB 521 Accounting for Management Planning and Control (4)	
GSB 522 Quantitative Business Analysis I (4)	
GSB 523 Managerial Economics (4)	
GSB 524 Marketing Management (4)	
Spring .....	16
GSB 531 Managerial Finance (4)	
GSB 532 Quantitative Business Analysis II (4)	
GSB 533 Aggregate Economic Analysis and Policy (4)	
GSB 534 Operations Management (4)	

**SECOND YEAR**

Fall.....	16
<sup>2</sup> GSB 541 Organizational Behavior (4)	
GSB 542 Marketing Research and Planning (4)	
<sup>3</sup> GSB 543 Information Systems for Decision Support (4)	
Electives (4)	
Winter.....	16
<sup>4</sup> GSB 551 Management in an International Environment (4)	
GSB 552 Financial Analysis and Planning (4)	
Electives (8)	
Spring .....	16
<sup>5</sup> GSB 561 Business, Government and Society (4)	
GSB 562 Business Strategy and Policy (4)	
Electives (8)	

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**AGRIBUSINESS SPECIALIZATION**

Add courses below in place of electives in MBA Program:

- AM 544 Advanced Farm and Ranch Management (4)
- AM 553 Agricultural Policy and Program Analysis (4)
- AM 554 Managing Price Risk in Agribusiness (4)
- AM 563 Agricultural Trade and Market Development (4)
- AM 564 Agribusiness Managerial Leadership and Communication (4)
- AG 539 Graduate Internship in Agriculture (4) or
- AG 500 Individual Study (4)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Graduate Studies in Business (GSB).

<sup>1</sup> Agribusiness Specialization students postpone taking GSB 514 until fall quarter of their second year in the program and instead take AM 564 as an elective during fall quarter of their first year.

<sup>2</sup> Not required from students with undergraduate business degrees; a replacement course must be taken (GSB 576 or GSB 595 recommended).

<sup>3</sup> Not required from students who have taken an equivalent course in their undergraduate programs. They must take a replacement course.

<sup>4</sup> Not required from Agribusiness Specialization Students.

<sup>5</sup> Not required from students with undergraduate business degrees; a replacement course must be taken.

# ACCOUNTING DEPARTMENT

## Faculty

### Department Head, William C. Boynton

Charles T. Andrews  
Mary Beth Armstrong  
Lawrence E. Baur, Jr.

Wallace H. Burt  
Janice L. Carr  
Robert W. Hill

Harold R. Miller  
David E. Nutter  
John C. Robison

## Programs

### B.S. Business Administration

The primary objectives of the Accounting Department are to: 1) provide students within the School of Business with a knowledge of the accounting information and systems relevant to business decisions; 2) prepare students for careers as professional accountants; 3) provide a service to other students from other schools within the university with an introduction to accounting and its uses.

## CURRICULUM IN ACCOUNTING

### Freshman

	F	W	S
BUS 101 The Business Enterprise .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>1</sup> Life and physical science electives (one each, one with lab)			
(B.1.) .....	3	3	3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
MATH 121 Finite Mathematics (B.2.) .....		3	
MATH 221 Calculus for Business and Economics (B.2.) .....			4
CSC 120 Principles of Business Data Processing (F.1.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Technology elective (F.2.) .....			2
	16	15	16

### Sophomore

ECON 221, ECON 222 Micro/Macro Economics (D.3.) .....	4	4	
ACTG 221, ACTG 222 Financial Accounting I and II .....	4	4	
HIST 204 History of American Ideals and Institutions (D.1.) ...			3
ENGL 215 Writing: Argumentation (A.4) .....	4		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
STAT 251 Statistical Inference for Management I (B.2.) .....	3		
STAT 252 Statistical Inference for Management II .....		3	
BUS 207 Business Law .....			4
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....			3
<sup>2</sup> Electives and courses to complete major .....		3	
	18	17	16

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
MGT 314 Human Resources Management .....		4	
MGT 317 Organizational Behavior .....			4
ACTG 301 Managerial Accounting .....	4		
FIN 342 Financial Management.....		4	
MKTG 301 Principles of Marketing.....	4		
MGT 312 Organization and Management Theory .....	4		
MGT 321 Management Information Systems .....			4
MGT 325 Production and Operations Management .....			4
ECON 337 Money, Banking and Credit .....		4	
<sup>2</sup> Electives and courses to complete major .....	4	4	4
	16	16	16
<b>Senior</b>			
HIST 315 Modern World History (D.2.) .....	3		
MGT 414 Business Strategy and Policy Seminar.....			4
ACTG 461, ACTG 462 Senior Project.....		2	2
BUS 404 Governmental and Social Influences on Business.....	4		
<sup>3</sup> Literature, philosophy, arts elective (C.3.) .....		3	
<sup>3</sup> ANT/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>2</sup> Electives and courses to complete major .....	10	10	11
	17	18	17

All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> 27 to 29 units of concentration electives must be chosen with approval of adviser.

<sup>3</sup> Must be 300-400 level course in accordance with General Education-Breadth requirements. (See adviser or Advisement Center.)



## BUSINESS ADMINISTRATION DEPARTMENT

### Faculty

**Department Head, Dan Bertozzi, Jr.**

Lee B. Burgunder  
James M. Buxbaum  
D. Jan Duffy  
Kiyoshi Kato

John R. Lindvall  
Lynn E. Metcalf  
Eugene L. O'Connor  
Walter W. Perlick

Kenneth D. Riener  
John C. Rogers  
Stanley B. Smith  
Louis W. Turley

### Programs

B.S. Business Administration with Concentrations in:

Financial Management

Marketing Management

The department offers an undergraduate program leading to the Bachelor of Science degree in Business Administration with concentrations available in Financial Management and Marketing Management.<sup>1</sup>

The objective of the Business Administration Department is to provide a level of education that will qualify graduates for entry-level positions in the fields of marketing, and/or finance. Within the concentrations, there is sufficient flexibility to allow each student the opportunity to develop proficiency in subject matter uniquely suited for the student's occupational goal.

The department provides service courses to many departments of the university, notably in Business Law and Public Policy. The department also provides major staff support for the Master's degree program in Business Administration. See Master of Business Administration for details of this program.

### CURRICULAR CONCENTRATIONS

#### Financial Management

This concentration provides both depth of exposure in finance as well as breadth of exposure to related fields for students interested in careers in finance. Students are exposed to specialized course work in corporate finance, investments, real estate, and financial markets. In addition, course work in computer science, management information systems, accounting, and economics is encouraged to provide broader familiarity with these important "tool" areas of finance. Successful graduates are much in demand for positions in banking, corporate financial planning areas, real estate, and many other business areas.

#### Marketing Management

This concentration emphasizes course work in all of the many areas traditionally covered in the marketing function. These areas include marketing research, sales management, physical distribution, promotion, and buyer behavior. As with the Financial Management concentration, students in Marketing Management are encouraged to take course work in other fields that have special importance to the student's career objective. Graduates of this concentration are in strong demand by a number of businesses, both profit and nonprofit, for a wide variety of occupations.

<sup>1</sup> The Agricultural Management Major is distinguished from a major in Business Administration. Agricultural Management emphasizes training in management for careers in agriculture. The program focuses on preparation of students for careers in firms that supply inputs and services to agricultural production enterprises and by those engaged in the processing, marketing, financing, distribution, and sales of agricultural products. In addition, there is a concentration available in the management of farms and ranches as a business enterprise. Thirty units of course work in production agriculture are required.

# CURRICULUM IN BUSINESS ADMINISTRATION

## Freshman

	F	W	S
BUS 101 The Business Enterprise .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Critical reading-English (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>1</sup> Life and physical science electives (one each, one with lab)			
(B.1.) .....	3	3	3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
MATH 121 Finite Mathematics (B.2.) .....		3	
MATH 221 Calculus for Business and Economics (B.2.) .....			4
CSC 120 Principles of Business Data Processing (F.1.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Technology elective (F.2.) .....			2
	16	15	16

## Sophomore

ECON 221, ECON 222 Micro/Macro Economics (D.3.) .....	4	4	
ACTG 221, ACTG 222 Financial Accounting I and II .....	4	4	
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
ENGL 215 Writing: Argumentation (A.4.) .....	4		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
STAT 251 Statistical Inference for Management I (B.2.) .....	3		
STAT 252 Statistical Inference for Management II .....		3	
BUS 207 Business Law .....			4
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
Electives and courses to complete major .....		3	
	18	17	16

## Junior

MGT 314 Human Resources Management .....		4	
MGT 317 Organizational Behavior .....			4
ACTG 301 Managerial Accounting .....	4		
FIN 342 Financial Management .....		4	
MKTG 301 Principles of Marketing .....	4		
MGT 312 Organization and Management Theory .....			4
MGT 321 Management Information Systems .....		4	
MGT 325 Production and Operations Management .....			4
ECON 337 Money, Banking, and Credit .....	4		
<sup>2</sup> Electives and courses to complete major .....	4	4	4
	16	16	16

Senior	F	W	S
HIST 315 Modern World History (D.2.) .....	3		
<sup>3</sup> ANT/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
MGT 414 Business Strategy and Policy Seminar .....			4
<sup>3</sup> Literature, philosophy, arts elective (C.3.) .....		3	
BUS 461, BUS 462 Senior Project .....		2	2
BUS 404 Government and Social Influences on Business .....	4		
<sup>2</sup> Electives and courses to complete major .....	10	10	11
	17	18	17

All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> 27 to 29 units of concentration electives must be chosen with approval of adviser.

<sup>3</sup> Must be upper division course in accordance with General Education- Breadth requirements. See adviser or advisement center.

## ECONOMICS DEPARTMENT

### Faculty

#### Department Head, Panagiotis Papakyriazis

John P. Adams, Jr.  
George L. Beardsley, Jr.  
George M. Eastham  
Michael W. Johnson

Timothy W. Kersten  
Artemis Papakyriazis  
Dominic B. Perello  
Walter E. Rice

Alden F. Shiers  
Fuad H. Tellew  
Daniel P. Williamson

### Programs

B.S. Economics with Concentrations in:

Business and Industrial Economics  
Quantitative Economics

International Trade and  
Development

The Economics Department has two broad purposes: it serves all schools of the campus by offering courses which will help students to understand the overall functioning of the American economy; and secondly, it offers an undergraduate program leading to the Bachelor of Science degree in Economics.

The Economics degree program will prepare students for employment in business and government as economists, analysts and general managers. The teaching of economics in high school is another occupational field for the economist. Finally, the program will prepare students to undertake graduate study in economics, law, business administration and related fields in the social sciences.

### CURRICULAR CONCENTRATIONS

Economics majors may take any concentration offered by the School of Business or the Political Science or Social Sciences departments in lieu of the economics concentrations described below, provided appropriate prerequisites are satisfied.

#### Business and Industrial Economics

The Business and Industrial Economics concentration, designed for those students who intend to seek business and industrial application of the economics discipline, provides a balanced program of economic and business theory and application.

#### International Trade and Development

This concentration provides a core of trade and development theory, plus study in ancillary elective fields that meet the occupational needs of students. It is designed for those students interested in working in an international area in the public or private sectors.

#### Quantitative Economics

This concentration will offer a combination of mathematics, statistics, and quantitative economics courses. As a unit they are designed to provide the graduate with a background adequate for employment in a variety of business and other situations where the economic decision makers rely on the precision of the mathematician's tools, or for entrance to graduate study in such fields as economics, business administration, or operations research.

**CURRICULUM IN ECONOMICS****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
ECON 105 Consumer Economics .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
CSC 120 Principles of Business Data Processing (F.1.) .....		4	
ACTG 221, ACTG 222 Financial Accounting I and II .....	4	4	
POLS 210 American and California Government (D.1.) .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....			2
<sup>1</sup> Life and physical Science electives (one each, one with lab) (B.1.) .....	3	3	3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		3	3
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Technology elective (F.2.) .....			2
	<u>17</u>	<u>17</u>	<u>16</u>

**Sophomore**

BUS 207 Business Law .....			4
ECON 221, ECON 222 Micro/Macro Economics (D.3.) .....	4	4	
<sup>2</sup> MATH 221 Calculus for Business and Economics (B.2.) .....	4		
<sup>2</sup> MATH 222 Math Analysis for Economics and Business (B.2.) ..		4	
<sup>2</sup> STAT 251 Statistical Inference for Management I (B.2.) .....		3	
<sup>2</sup> STAT 252 Statistical Inference for Management II .....			3
ENGL 215 Writing: Argumentation (A.4.) .....		4	
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
PSY 202 General Psychology (E.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
Electives .....	3		4
	<u>17</u>	<u>18</u>	<u>17</u>

**Junior**

ECON 311, ECON 312 Intermediate Microeconomics and			
ECON 313 Macroeconomics .....	4	4	4
HIST 315 Modern World History (D.2.) .....	3		
GEOG 315 Geography of Resource Utilization .....			3
ECON 304 Comparative Economic Systems .....		3	
ECON 324 American Economic History .....			3
ECON 337 Money, Banking and Credit .....	4		
<sup>1</sup> ANT/BUS/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>3</sup> Electives and courses to complete major .....	5	6	6
	<u>16</u>	<u>16</u>	<u>16</u>

<b>Senior</b>	<b>F</b>	<b>W</b>	<b>S</b>
<sup>1</sup> Critical reading elective (C.1.) .....			3
ECON 410 Cost-Benefit Analysis .....	4		
ECON 314 Monetary and Fiscal Policy .....	4		
ECON 317 Development of Economic Analysis .....		3	
ECON 461, ECON 462 Senior Project .....	2	2	
ECON 463 Undergraduate Seminar .....			2
<sup>3</sup> Electives and courses to complete major .....	6	11	11
	16	16	16

See COURSES OF INSTRUCTIONS section of this catalog for descriptions of courses in Economics and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> Students in the Quantitative Concentration take MATH 141, MATH 142, MATH 143, and STAT 321, STAT 322 in lieu of these courses.

<sup>3</sup> 18 to 20 units to be selected in a field of concentration.

## MANAGEMENT DEPARTMENT

### Faculty

#### Department Head, Robert H. McIntire

Melvin W. Aussieker, Jr.  
Allan S. Baillie  
H. Kenneth Bobele  
Robert K. Coe

Milton Drandell  
Eldon Y. Li  
Ernest C. Miller  
Rolf E. Rogers

Abraham B. Shani  
Michael W. Stebbins  
Emil A. Thies  
Donald A. Yale

### Programs

B.S. Business Administration with Concentrations in:

Human Resources Management  
International Business Management  
Management

Management Information Systems  
Production and Operations  
Management

The objectives of the Management Department are to provide knowledge and skills of modern management theory and practice through the study of subjects critical to management performance (including general management, human resources management, international management, management information systems, and production and operations management); to develop in the student knowledge and skills of a second area or function to facilitate initial employment and subsequent career development; to help the student to acquire an appreciation of cultural, economic, political and technological trends which affect the role of managers in contemporary society; to help professionally oriented students use theories, concepts, research findings, problem-solving techniques, and analytical skills in management situations; and to provide a broad background and generalist viewpoint by encouraging study of individual courses in several knowledge and skill areas (including labor, economics, and social and political science).

The degree awarded is the Bachelor of Science in Business Administration with concentrations in Human Resources Management, International Business Management, Management, Management Information Systems, and Production and Operations Management.

### CURRICULAR CONCENTRATIONS

#### Human Resources Management

The two areas of interest within this concentration relate to labor management relations and personnel management. Students learn how to perform the functions of recruitment, selection, development, compensation, contract negotiations, and administration.

#### International Business Management

This concentration is designed to provide the student the opportunity to develop proficiency in the subject matter basic to an occupational goal in the management of international/multinational operations. It provides cultural understanding, organizational knowledge and analytical skill central to international business management.

#### Management

This concentration stresses the managerial process and decision making fundamental to all levels and functional areas of the business and industrial enterprise. The management program offers both quantitative and general management emphases to satisfy the individual needs of the student relative to business or academic ambitions.

**Management Information Systems**

This concentration is designed to prepare students for careers involving the analysis, design, and operation of business information systems within industry and government. It provides training and practice in administrative data processing and in the analysis of managerial information requirements.

**Production and Operations Management**

This concentration prepares students for careers in production and operations management with business or service organizations. It provides training in purchasing; cost, quality, and inventory control; materials planning; and other production or operations management functions.

**CURRICULUM IN MANAGEMENT**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
BUS 101 The Business Enterprise .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>1</sup> Life and physical science electives (one each, one with lab)			
(B.1.) .....	3	3	3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
MATH 121 Finite Mathematics (B.2.) .....		3	
MATH 221 Calculus for Business and Economics (B.2.) .....			4
CSC 120 Principles of Business Data Processing (F.1.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Technology elective (F.2.) .....			2
	16	15	16
<b>Sophomore</b>			
ECON 221 Microeconomics and			
ECON 222 Macroeconomics (D.3.) .....	4	4	
ACTG 221, ACTG 222 Financial Accounting I and II .....	4	4	
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
ENGL 215 Writing: Argumentation (A.4.) .....	4		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
STAT 251 Statistical Inference for Management I (B.2.) .....	3		
STAT 252 Statistical Inference for Management II .....		3	
BUS 207 Business Law .....			4
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....			3
<sup>2</sup> Electives and courses to complete major .....		3	
	18	17	16



		F	W	S
<b>Junior</b>				
MGT 314	Human Resources Management .....			4
MGT 317	Organizational Behavior .....			4
ACTG 301	Managerial Accounting .....		4	
FIN 342	Financial Management .....			4
MKTG 301	Principles of Marketing .....	4		
MGT 312	Organization and Management Theory .....	4		
ECON 337	Money, Banking and Credit .....		4	
MGT 321	Management Information Systems .....	4		
MGT 325	Production and Operations Management .....	4		
<sup>2</sup>	Electives and courses to complete major .....		8	4
		16	16	16
<b>Senior</b>				
HIST 315	Modern World History (D.2.) .....	3		
MGT 414	Business Strategy and Policy Seminar .....			4
MGT 461, MGT 462	Senior Project .....		2	2
BUS 404	Government and Social Influences on Business .....	4		
<sup>3</sup>	Literature, philosophy, arts elective (C.3.) .....		3	
<sup>3</sup>	ANT/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>2</sup>	Electives and courses to complete major .....	10	10	11
		17	18	17

All of the above courses except the electives are common to the Business Administration Department, Management Department, and Accounting Department curricula required for the B.S. in Business Administration.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Accounting, Business, Economics, Financial Management, Management, Marketing and other subjects.

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<sup>2</sup> 27 to 29 units of concentration electives must be chosen with the approval of adviser.

<sup>3</sup> Must be upper division course selected in accordance with General Education-Breadth requirements. See adviser or advisement center.



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## School of Engineering

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Electronic Technology Option	
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Primary fields of study:	
Aeronautical Engineering	
Biochemical Engineering	
Civil and Environmental Engineering	
Computer Engineering	
Electrial Engineering	
Electronic Engineering	
Industrial Engineering	
Mechanical Engineering	
Metallurgical Engineering	



## SCHOOL OF ENGINEERING

Duane F. Bruley, Dean  
Peter Y. Lee, Associate Dean

The School of Engineering offers programs leading to the Bachelor of Science degree in nine engineering disciplines, and in the disciplines of computer science and engineering technology. It also offers programs leading to the Master of Engineering degree and the Master of Science in Computer Science.

Engineering and computer science at Cal Poly are strongly oriented toward preparing young people for immediate entry into professional practice upon graduation from one of the four-year bachelor's degree programs. Each student selects a major at entrance and generally takes at least one course in that major each quarter. This early introduction increases motivation to master the mathematics, basic science, and engineering science or computer science which constitute a very important portion of each curriculum.

Cal Poly engineering and computer science graduates are in great demand and find a large variety of challenges awaiting them. They enter professional occupations such as engineering design, computer hardware and software engineering, test and evaluation, systems analysis, modeling and simulation, manufacturing, applied research, development, sales, and field engineering. Graduates pursue careers in a broad cross-section of industry, government agencies, public utilities, marketing groups, and educational institutions.

Engineering degree curricula offered in the School of Engineering leading to the Bachelor of Science degree are: Aeronautical Engineering, Civil Engineering, Electrical Engineering, Electronic Engineering, Engineering Science, Environmental Engineering, Industrial Engineering, Mechanical Engineering, and Metallurgical Engineering. These nine engineering disciplines provide the education for entry to the engineering profession and for continued academic work toward advanced degrees. Many of our graduates enter graduate school at Cal Poly or another institution.

The Accreditation Board for Engineering and Technology (ABET) defines engineering as "the profession in which a knowledge of the mathematical and natural sciences gained by study, experience, and practice is applied with judgment to develop ways to utilize economically the materials and forces of nature for the benefit of mankind."

The curriculum offered in the School of Engineering leading to the Bachelor of Science in Engineering Technology includes five options: Air Conditioning-Refrigeration Technology, Electronic Technology, Manufacturing Processes Technology, Mechanical Technology and Welding Technology. The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) defines engineering technology as follows: "Engineering technology is part of a continuum extending from the craftsman to the engineer. Located nearest the engineer, it requires the application of scientific and engineering principles in support of engineering activities."

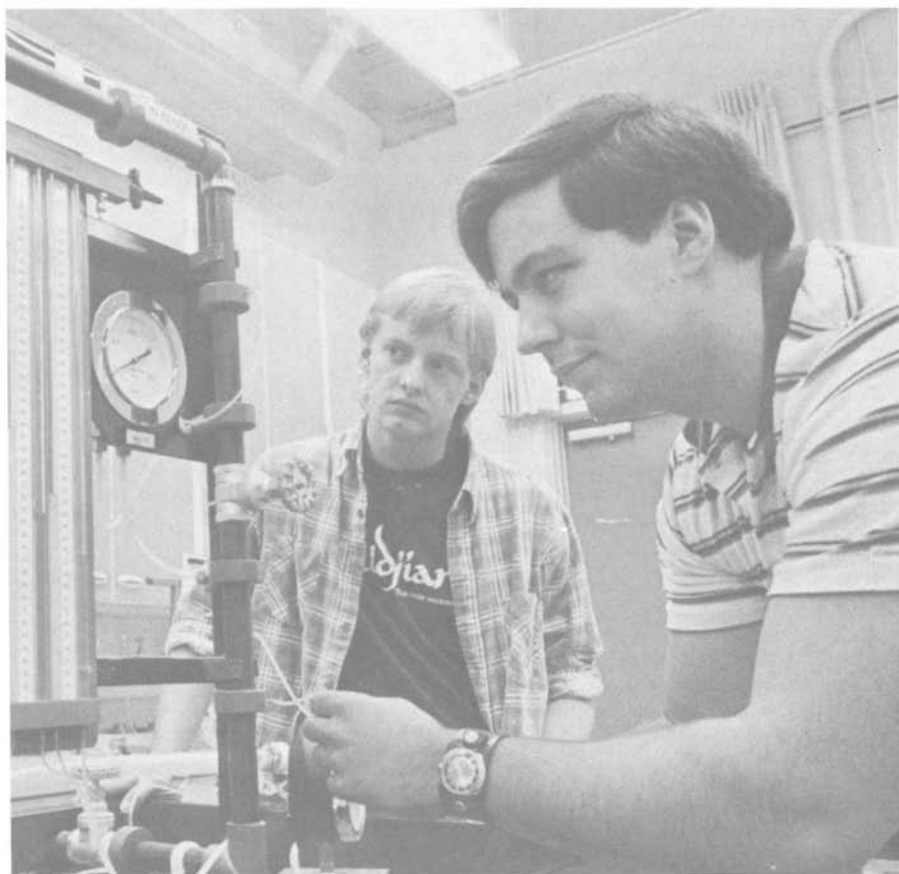
The School of Engineering also offers the Bachelor of Science degree in Computer Science which is designed to be in accordance with the model computer science curricula of the newly established Computing Sciences Accreditation Board (CSAB). Numerous laboratory and project experiences enhance the practical skills of the graduate. They are equally prepared for the practice of computer science and graduate study.

Attention is directed to the preceding chart on recommended community college preparation for engineering, computer science, and engineering technology major curricula. This chart should be studied and followed in order to prevent loss of time in completing the program after transferring to Cal Poly.

Engineering students must select their social sciences and humanities electives with a view to satisfying not only the general education—breadth requirement of The California State University, but also the humanities and social sciences requirements of the Accreditation Board for Engineering and Technology (ABET). *(No skills classes are acceptable.)*

The master's degree programs in the School of Engineering are built upon the excellence of Cal Poly's undergraduate engineering and computer science programs. Industry most often considers the master's degree as an important requirement for the design, development, applied research and analysis occupations in engineering and computer science. The master's degree allows entry into these occupations at higher levels of technical skills and responsibilities.

The M.S. in Computer Science has special provisions for students whose undergraduate degree is in a field other than computer science. Students from a wide variety of fields have earned the M.S. in Computer Science by following a carefully designed remedial curriculum prior to enrolling in graduate courses. A similar program is available in the engineering master's degree program for students whose undergraduate degree is in a closely related field of science.



## MASTER OF ENGINEERING DEGREE

### General Characteristics

The Master of Engineering program has as its objectives:

- Job-entry education for the more complex areas of engineering, such as research and development, innovative design, systems analysis and design, and managerial engineering;
- Both updating and upgrading opportunities for practicing engineers;
- Graduate preparation for further study in engineering, leading to the Doctor of Engineering or Ph.D. degree;
- A base which allows graduates to maintain currency in their fields.

### Prerequisites

Usually, for admission as a classified graduate student, an applicant must hold a bachelor's degree in engineering or a closely related physical science with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted. Applicants for graduate engineering programs are required to submit satisfactory scores for the General (Aptitude) Test and Engineering Subject (Advanced) Test of the Graduate Record Examination. An applicant who meets these standards but lacks prerequisite course work may be admitted as a conditionally classified student and must make up any deficiencies before advancement to classified graduate standing.

Information pertaining to specific requirements for admission to graduate standing (classified or conditionally classified) may be obtained from the Dean of the School of Engineering.

### Program of Study

Graduate students must file a formal study plan with their adviser by no later than the end of the quarter in which the 12th unit of approved courses is completed.

This graduate study plan must include a minimum of 45 units (at least 24 of which must be at the 500 level) with a primary field of study in one of the following areas:

Aeronautical Engineering  
 Biochemical Engineering  
 Civil and Environmental Engineering  
 Computer Engineering  
 Electrical Engineering  
 Electronic Engineering  
 Industrial Engineering  
 Mechanical Engineering  
 Metallurgical Engineering

The broad curriculum requirements for the Master of Engineering degree are:

- a) a minimum of 24 units in the field of specialization, with at least 18 units at the 500 level;
- b) a minimum of 9 units from an approved list of mathematics, statistics, computer science, or analytic engineering courses, with at least 3 units at the 500 level. For the Industrial Engineering field of study, certain specified Graduate Studies in Business courses may be chosen.
- c) the remaining units taken from a list of approved electives;
- d) at least 24 units of the 45 unit program at the 500 level.

In some primary fields of study, two program options are available for Master of Engineering students: a thesis program which requires course work, a thesis and oral defense of thesis; or a nonthesis option which involves additional course work and a comprehensive examination (written or written and oral). The nonthesis option is normally allowed only for those students who have completed an undergraduate senior project or have had significant engineering project experience.

Curriculum for the Master of Engineering Degree with a Primary Field of Study in Aeronautical Engineering

	Units
Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9)	
ENGR 563 Graduate Seminar (1) (1) (1)	
Courses in Primary Field of Study .....	24
AERO 503 Advanced Structural Analysis (3)	
AERO 508 Computational Fluid Dynamics (3)	
AERO 599 Design Project (Thesis) (2) (2) (5)	
Remaining 9 units to be from the the following with approval of adviser:	
AERO 405 Aerodynamics II (3)	
AERO 409 Flight Test (3)	
AERO 411 Space Technology (3)	
AERO 412 Composite Structures (4)	
AERO 416 Unconventional Aircraft (3)	
AERO 418 Introduction to Flight Simulation (3)	
AERO 421 Stability and Control (3)	
AERO 423 Flight Control Systems (3)	
AERO 501 Advanced Flight Dynamics (3)	
AERO 502 Flight Simulation (4)	
AERO 505 Theoretical Aerodynamics (3)	
AERO 506 Elements of Rocket Propulsions (3)	
AERO 570 Special Topics (3)	
Approved Electives .....	9
	45

Curriculum for the Master of Engineering Degree with a Primary Field of Study in Biochemical Engineering

	Units
Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9)	
ENGR 563 Graduate Seminar (1) (1) (1)	
Required Courses in Primary Field of Study .....	28
ME 541 Advanced Thermodynamics (4)	
ME 552 Conductive Heat Transfer (3)	
ME 553 Convective Heat Transfer (3)	
CHEM 572 Advanced Biochemistry (3)	
CHEM 573 Advanced Biochemistry (3)	
CHEM 574 Advanced Biochemistry (3)	
ENGR 599 Design Project (Thesis) (2) (2) (5) or	
9 units of approved technical electives	
Approved Electives .....	5
	45

<sup>1</sup> Chosen with adviser's approval from a course list approved by the School of Engineering Graduate Studies Committee.



## Curriculum for the Master of Engineering Degree with a Primary Field of Study in Civil and Environmental Engineering Units

Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9)	
ENGR 563 Graduate Seminar (1)	
CE 591 Graduate Seminar (2)	
Courses in Primary Field of Study .....	22-33
To be selected from the following with adviser's approval:	
CE 407 Structural Dynamics (4)	
CE 422 Geometric Design of Highways (4)	
CE 424 Public Transportation (4)	
CE 431 Coastal Hydraulics (3)	
CE 434 Ground Water Hydraulics and Hydrology (3)	
CE 487 Rock Mechanics (3)	
CE 500 Individual Study (1-3)	
CE 521 Airfield and Highway Pavement Design (4)	
CE 523 Transportation Systems Planning (4)	
CE 525 Airport Planning and Design (4)	
CE 527 Traffic Engineering - Operations and Controls (4)	
CE 533 Advanced Water Resources Engineering (3)	
CE 554 Matrix Analysis of Structures (3)	
CE 558 Introduction to Finite Element Analysis (3)	
CE 559 Advanced Structural Design (3)	
CE 570 Selected Advanced Topics (1-3)	
CE 571 Selected Advanced Laboratory (3)	
CE 573 Public Works Administration (3)	
CE 574 Computer Applications in Civil Engineering (3)	
CE 584 Advanced Soil Mechanics I (3)	
CE 585 Advanced Soil Mechanics II (3)	
CE 586 Advanced Foundation Engineering (4)	
CE 599 Design Project (Thesis) (2) (2) (5)	
ENVE 411 Air Pollution Control (3)	
ENVE 421 Mass Transfer Operations (3)	
ENVE 434 Water Quality Measurements (2)	
ENVE 436 Introduction to Hazardous Waste Management (3)	
ENVE 439 Solid Waste Management (3)	
ENVE 441, 442 Advanced System Design (3) (3)	
ENVE 465 Environmental Management and Urban Systems (2)	
ENVE 534 Advanced Design of Pollution Control Systems (3)	
ENVE 535 Advanced Wastewater Treatment (3)	
ENVE 536 Biological Wastewater Treatment Processes Engineering (3)	
ENVE 541 Resource and Energy Recovery from Waste (3)	
ENVE 599 Design Project (Thesis) (2) (2) (5)	
Approved electives .....	0-11
	45

<sup>1</sup> Chosen with adviser's approval from a course list approved by the School of Engineering Graduate Studies Committee.

**Curriculum for the Master of Engineering Degree with a Primary Field of Study in Computer Engineering***Units*

Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9)	
EE 563 Graduate Seminar (1) (1) (1)	
Courses in Primary Field of Study .....	25
EL 515 Discrete Time Filters (3)	
EL 520 Digital Systems Design (3)	
EL 521 Computer Systems (3)	
EL 522 Microprocessor-Based Digital System Design (4)	
EL 526 Digital Communications (3)	
EE 599 Design Project (Thesis) (2) (2) (5) or	
9 units of approved technical electives	
Approved technical electives .....	<u>8</u>
	45

**Curriculum for the Master of Engineering Degree with a Primary Field of Study in Electrical Engineering***Units*

Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9)	
EE 563 Graduate Seminar (1) (1) (1)	
Courses in Primary Field of Study .....	25
EE 511 Electric Machines Theory (3)	
EE 513 Control Systems Theory (3)	
EE 518 Advanced Power System Analysis (3)	
EE 519 Power System Design (4)	
EE 520 Solar-Photovoltaic Systems Design (3)	
EE 599 Design Project (Thesis) (2) (2) (5) or	
nine units of approved technical electives	
Approved technical electives .....	<u>11</u>
	45

<sup>1</sup> Chosen with adviser's approval from a course list approved by the School of Engineering Graduate Studies Committee.

## Curriculum for the Master of Engineering Degree with a Primary Field of Study in Electronic Engineering

Units

Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9)	
EE 563 Graduate Seminar (1) (1) (1)	
Courses in Primary Field of Study .....	24
EL 515 Discrete Time Filters (3)	
EL 520 Digital Systems Design (3)	
EL 524 Solid State Electronics (3)	
EL 526 Digital Communications (3)	
EL 528 Topics in Telecommunication Systems (3)	
EE 599 Design Project (Thesis) (2) (2) (5) or nine units of approved technical electives	
Approved technical electives .....	9
	45

## Curriculum for the Master of Engineering Degree with a Primary Field of Study in Industrial Engineering

Units

Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9)	
ENGR 563 Graduate Seminar (1) (1) (1)	
Courses in Primary Field of Study .....	22
IE 470 Advanced Topics (4)	
IE 500 Individual Study (2)	
IE 541 Advanced Operations Research (3)	
IE 542 Reliability Engineering (3)	
IE 543 Advanced Human Factors (4)	
IE 599 Design Project (Thesis) (2) (2) (5) or 9 units of approved technical electives	
Approved electives .....	11
	45

<sup>1</sup> Chosen with adviser's approval from a course list approved by the School of Engineering Graduate Studies Committee.

### Curriculum for the Master of Engineering Degree with a Primary Field of Study in Mechanical Engineering

	<i>Units</i>
Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9) ENGR 563 Graduate Seminar (1) (1) (1)	
Courses in Primary Field of Study .....	24
ME 599 Design Project (Thesis) (2) (2) (5)	
15 units to be selected from the following:	
ME 502 Stress Analysis (4)	
ME 517 Advanced Vibrations (4)	
ME 526 Dynamics of Mechanical Systems (4)	
ME 541 Advanced Thermodynamics (4)	
ME 542 Dynamics and Thermodynamics of Compressible Fluid Flow (4)	
ME 550 Kinematic Analysis and Design (3)	
ME 551 Mechanical Systems Analysis (4)	
ME 552 Conductive Heat Transfer (3)	
ME 553 Convective Heat Transfer (3)	
ME 556 Stability of Structural Systems (3)	
Approved electives .....	9
	45

### Curriculum for the Master of Engineering Degree with a Primary Field of Study in Metallurgical Engineering

	<i>Units</i>
Core Courses .....	12
<sup>1</sup> Advanced Mathematics/Analytical Methods for Engineering (9) ENGR 563 Graduate Seminar (1) (1) (1)	
Courses in Primary Field of Study .....	24
To be selected from the following:	
MET 421 Metallurgical Thermodynamics (4)	
MET 424 Applied Metallurgical Engineering (3)	
MET 500 Individual Study (1-3)	
MET 562 Mechanical Metallurgy (3)	
MET 564 Fracture Mechanics and Stress Corrosion Cracking (3)	
MET 599 Design Project (Thesis) (2) (2) (5) or 9 units of approved technical electives	
PHYS 412 Solid State Physics for Engineers (3)	
Approved Electives .....	9
	45

<sup>1</sup> Chosen with adviser's approval from a course list approved by the School of Engineering Graduate Studies Committee.

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## AERONAUTICAL ENGINEERING DEPARTMENT

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### Faculty

#### Department Head, E. Roberts Wood

Alfred E. Andreoli  
Thomas W. Carpenter

Jon A. Hoffmann  
Faysal Kolkailah

Doral R. Sandlin

### Programs

#### B.S. Aeronautical Engineering

The Bachelor of Science degree in Aeronautical Engineering prepares students for engineering work related to aerodynamics, flight testing, structures, propulsion, control systems, dynamics, stability and control, and flight simulation for both fixed and rotary wing aircraft, missiles, and spacecraft. The problems faced by the aerospace industry offer an unusual engineering challenge. Much of the analysis and testing must be accomplished at the very frontiers of knowledge. Nevertheless, products must be designed and manufactured; thus, an exceptionally wide range of engineering abilities is required within the industry and government.

The curriculum in Aeronautical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. It places emphasis on both analysis and design. Supplementary to both is the basic work in graphics and laboratory. Throughout the entire four-year curriculum there is constant interplay between theory and application. Opportunities are available for advanced elective work in the student's field of special interest.

Graduates in aeronautical engineering obtain employment in all phases of the aerospace industry such as general design, aerodynamics, stress analysis, flight testing, flight simulation, dynamics, and stability and control.

There are laboratory facilities for fabrication, propulsion, structural test, aerodynamics, dynamics, flight simulation and flight test, and two design rooms. There is also a hangar and aircraft with an adjoining airstrip.

There are four student chapters of the national societies—the American Institute of Aeronautics and Astronautics, the American Helicopter Society, the Society of Flight Test Engineers, and the Society for the Advancement of Material and Process Engineering.

#### GRADUATE PROGRAMS

For information regarding the Master of Engineering degree program with a primary field of study in aeronautical engineering, please see page 211 of this catalog.

**CURRICULUM IN AERONAUTICAL ENGINEERING**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
AERO 121, AERO 122, AERO 123 Aerospace Fundamentals .....	1	1	1
ETMP 121 Manufacturing Survey .....		1	
ETME 141 Applied Descriptive Geometry .....	2		
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ...		4	
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
CHEM 124 General Chemistry (B.1.a.) .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
	<u>17</u>	<u>17</u>	<u>17</u>
<b>Sophomore</b>			
AERO 201 Aerodynamics I .....	3		
AERO 202 Problems in Aeronautical Engineering .....	2		
ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....		4	
CE 204, CE 205, CE 206 Strength of Materials and Laboratory ....		3	3
EE 201, EE 261 Electric Circuit Theory and Laboratory .....			4
PHYS 133 General Physics .....	4		
PHYS 210 Introduction to Modern Physics .....		4	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
MATH 318 Advanced Engineering Mathematics (B.2.) .....			4
<sup>2</sup> Manufacturing Processes elective .....	1		
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....		3	
	<u>17</u>	<u>18</u>	<u>17</u>
<b>Junior</b>			
AERO 301, AERO 302, AERO 303, AERO 304 Aerothermodynamics and Laboratory .....	5	5	5
AERO 324 Stress Analysis .....			4
AERO 306 Aerodynamics II .....		3	
AERO 307 Wind Tunnel and Flight Test Laboratory .....	2		
CSC 332 Numerical Analysis I (F.1.) .....	3		
EL 321, EL 361 Electronics and Laboratory .....	4		
MET 306 Materials Engineering .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
HIST 315 Modern World History (D.2.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
POLS 210 American and California Government (D.1.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....		3	
	<u>17</u>	<u>17</u>	<u>18</u>

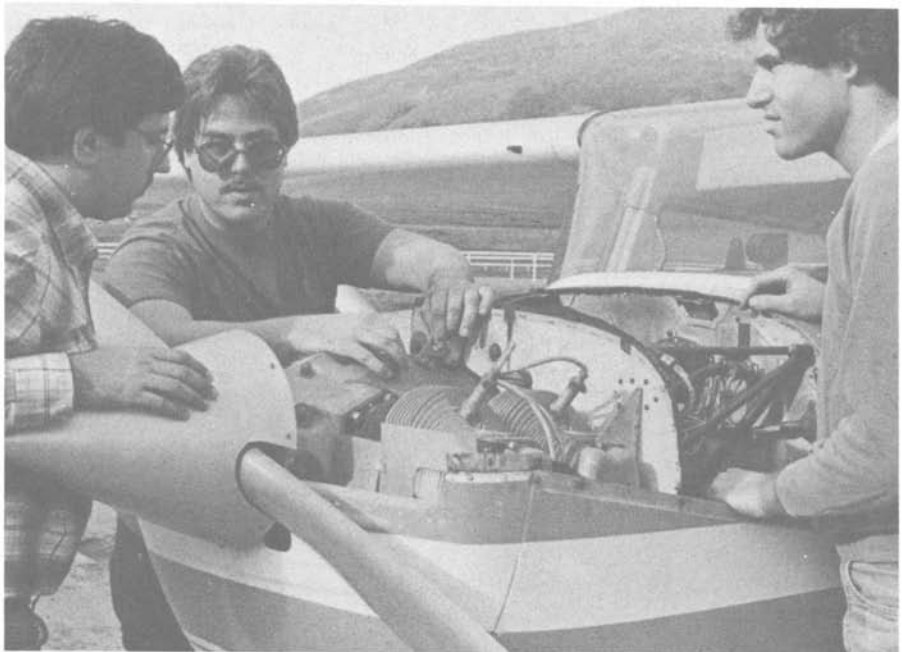
Senior	F	W	S
AERO 420 Stability and Control of Aircraft I.....	3		
AERO 444, AERO 445 Flight Vehicle Design .....		4	4
AERO 401 Propulsion Systems .....		4	
AERO 408 Advanced Flight Vehicle Structural Analysis .....	4		
AERO 404 Gas Dynamics .....	4		
AERO 461, AERO 462 Senior Project .....	2	3	
AERO 464 Industry Seminar .....	1		
<sup>1</sup> Critical reading electives (C.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (3 units at 300-400 level) (C.3.) .....			6
<sup>3</sup> Aeronautical Engineering electives .....	4	6	3
	18	17	16

See COURSES OF INSTRUCTION section of this catalog for description of courses in Aeronautical Engineering and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. See adviser and page 98 of this catalog.

<sup>2</sup> To be selected from ETMP 144, ETWT 144, IE 141, or IT 141.

<sup>3</sup> To be chosen with adviser approval.



# CIVIL AND ENVIRONMENTAL ENGINEERING DEPARTMENT

## Faculty

### Department Head (Interim), Stephen Hockaday

Marshall L. Anderson  
Harold M. Cota  
Carl C. Hsieh

Stuart E. Larsen  
C. K. Lo  
H. Mallareddy  
Dragoslav Mistic

L. Alexander Ortiz  
Robert E. Sennett  
S. Somayaji  
Samuel A. Vigil

## Programs

B.S. Civil Engineering

B.S. Environmental Engineering

## CURRICULUM IN CIVIL ENGINEERING

Civil engineers are concerned with the structures in which we live and work, the transportation systems by which we travel, and the environment around us. The Bachelor of Science degree in Civil Engineering emphasizes the study of engineering principles and the application of scientific knowledge and technology for the betterment of mankind. The program stresses the team design concept and systems approach to problem solving and is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Graduates of the program are trained for the expanding needs of society in transportation, structure and environment under the broad Civil Engineering degree. The emphasis is on preparation for immediate entry into the profession. Students completing the program will find a wide variety of positions available in local, state, and federal government service or with private engineering firms. These include positions involved in the planning, design, and construction of civil engineering projects.

The curriculum includes surveying, structural engineering, hydraulics, geotechnical engineering, sanitary engineering, and transportation planning—all based upon broad coverage of the engineering sciences and basic sciences, mathematics, social sciences, and humanities. The program is oriented toward the practical problems of the industrial world, but adequate scientific depth is maintained so that graduates will be readily accepted into graduate programs in civil engineering.

### GRADUATE PROGRAMS

For information regarding the Master of Engineering degree program with a primary field of study in civil and environmental engineering, please see page 211 of this catalog.

#### Freshman

	F	W	S
CE 111, CE 112 Civil Engineering Fundamentals I and II .....	1	2	
ETME 141 Applied Descriptive Geometry .....			2
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131 General Physics (B.1.a.) .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
	16	16	17



**Sophomore**

	<b>F</b>	<b>W</b>	<b>S</b>
CE 221 Transportation Engineering I .....	4		
CE 204, CE 205, CE 206 Strength of Materials and Laboratory ....		3	3
CE 259 Civil Engineering Materials .....			2
ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....		4	
ME 341 Fluid Mechanics .....			3
AE 237, AE 238 Engineering Surveying .....		2	2
MATH 241 Analytic Geometry and Calculus (B.2.) .....	4		
MATH 242 Differential Equations .....		4	
GEOL 201 Physical Geology .....			3
PHYS 132, PHYS 133 General Physics .....	4	4	
ECON 211 Principles of Economics (D.3.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
	<u>18</u>	<u>17</u>	<u>16</u>

**Junior**

CE 352, CE 353 Structural Analysis I and II .....	3	3	
MET 306, MET 341 Materials of Engineering and Laboratory ....	3	1	
CE 355 Reinforced Concrete Design .....			3
CE 381 Geotechnical Engineering I .....		4	
EE 201, EE 261 Electric Circuits Theory and Laboratory .....			4
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
HIST 315 Modern World History (D.2.) .....			3
CSC 331 Numerical Linear Analysis (F.1.) .....	3		
ME 302 Thermodynamics I .....		3	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ....			4
CE 336 Water Resources Engineering .....		4	
CE 337 Hydraulics Laboratory .....			1
ENVE 331 Introduction to Environmental Engineering .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
	<u>18</u>	<u>18</u>	<u>18</u>

**Senior**

STAT 321 Statistical Analysis (B.2.) .....			3
CE 453 Structural Steel Design .....	3		
CE 461, CE 462 Senior Project .....	2	3	
CE 440 Water and Wastewater Engineering .....			4
CE 481 Geotechnical Engineering II .....	4		
CE 464 Professional Practice .....		3	
CE 421 Transportation Engineering II .....		4	
CE 407 Structural Dynamics .....			4
CE 454 Structural Design .....			4
PSY 202 General Psychology (E.1.) .....	3		
SPC 201 Public Speaking (A.3.) .....		3	
<sup>1</sup> Literature elective (300-400 level) (C.3.) .....	3		
<sup>1</sup> Humanities elective (300-400 level) (C.3.) .....		3	
<sup>2</sup> Approved technical electives .....	3	3	3
	<u>18</u>	<u>19</u>	<u>18</u>

<sup>1</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 98 of this catalog.)

<sup>2</sup> To be selected with adviser approval from departmental list.

CURRICULUM IN ENVIRONMENTAL ENGINEERING

The Bachelor of Science degree in Environmental Engineering is concerned with the interrelation of man, materials, and processes in a complex and changing environment. The broad field of environmental engineering includes control of air and water pollution, industrial hygiene, reduction of noise and vibration, and solid waste management.

The program offers a sound background in the fundamentals of thermodynamics, heat transfer, fluid mechanics, mass transfer, and physico-chemical characteristics of living and inanimate matter. The problem-oriented approach to instruction, in modern well-equipped laboratories, shops and design rooms, provides the student an excellent opportunity to gain understanding and experience in a joint exploration with the faculty. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

The Environmental Sciences and Engineering Club offers vigorous programs of technical and other activities, including field trips each year to the Los Angeles and San Francisco areas to study typical installations of systems. Student memberships also are available in the Air Pollution Control Association, the California Water Pollution Control Association, and the Water Pollution Control Federation.

An engineering approach to the subject enables graduates to pursue careers in industry, consulting firms, and public agencies concerned with air and water pollution control, potable water treatment, and solid waste management.

GRADUATE PROGRAMS

For information regarding the Master of Engineering degree program with a primary field of study in civil and environmental engineering, please see page 211 of this catalog.

Freshman	F	W	S
ETME 141 Applied Descriptive Geometry .....			2
CE 111, CE 112 Civil Engineering Fundamentals I and II .....	1	2	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ....		4	
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
CHEM 124, CHEM 125, CHEM 129 General Chemistry (B.1.a.) .....	4	4	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
<sup>1</sup> Critical reading elective (C.1.) .....	3		
	16	18	17
Sophomore			
CE 221 Transportation Engineering I .....	4		
CE 204, CE 205 Strength of Materials .....		3	2
ME 341 Fluid Mechanics .....			3
ME 211 Engineering Statics .....		3	
ME 212 Engineering Dynamics .....			4
ME 302 Thermodynamics I .....			3
MATH 241 Analytic Geometry and Calculus (B.2.) .....	4		
MATH 242 Differential Equations .....		4	
PSY 202 General Psychology (E.1.) .....			3
PHYS 133 General Physics .....	4		
<sup>1</sup> Critical reading elective (C.1.) .....	3		
STAT 321 Statistical Analysis (B.2.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
ECON 211 Principles of Economics (D.3.) .....			3
CHEM 326 Survey of Organic Chemistry .....		4	
	18	17	18

Junior	F	W	S
ENVE 326 Air Pollution Measurements .....			3
ENVE 309 Noise and Vibration Control .....	3		
ME 313 Heat Transfer .....	3		
ENVE 325 Environmental Air Quality .....	3		
ENVE 304 Thermodynamics of Processes .....		3	
ENVE 316 Automatic Process Control .....			2
CE 381 Geotechnical Engineering I .....		4	
CE 336 Water Resources Engineering .....		4	
CE 337 Hydraulics Laboratory .....		1	
EE 201 Electric Circuit Theory .....	3		
EE 261 Electric Circuit Laboratory .....		1	
<sup>1</sup> Literature elective (300-400 level) (C.3.) .....		3	
CSC 331 Numerical Linear Analysis (F.1.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
SPC 201 Public Speaking (A.3.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
	18	16	18
Senior			
ENVE 421 Mass Transfers Operations .....			3
ENVE 436 Introduction to Hazardous Waste Management.....		3	
ENVE 441, ENVE 442 Advanced System Design .....	3	3	
ENVE 461, ENVE 462 Senior Project .....	2	2	
ENVE 411 Air Pollution Control .....	3		
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
HIST 315 Modern World History (D.2.) .....	3		
CE 434 Groundwater Hydraulics.....		3	
ENVE 434 Water Quality Measurements .....		2	
CE 440 Water and Wastewater Engineering .....	4		
<sup>1</sup> Humanities elective (300-400 level) (C.3.) .....	3		
ENVE 438 Water and Waste Water Treatment .....		3	
ENVE 439 Solid Waste Management .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
Approved technical electives .....		3	5
	18	19	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Civil Engineering, Environmental Engineering, and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-breadth requirements. (Please see page 98 of this catalog.)

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## COMPUTER SCIENCE DEPARTMENT

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### Faculty

#### Department Head (Interim), Neil W. Webre

Emile E. Attala  
 Jay S. Bayne  
 James L. Beug  
 Raymond E. Boche  
 Roger C. Camp  
 Laurian M. Chirica  
 Charles H. Dana

Robert H. Dourson  
 Joseph E. Grimes  
 Roy B. Hollstien  
 John Y. S. Hsu  
 Timothy J. Kearns  
 Elmo A. Keller  
 Sham S. Luthra

William K. Michaud  
 Maureen C. Mellon  
 Zane C. Motteler  
 Leonard D. Myers  
 Cornel K. Pokorny  
 Daniel F. Stubbs  
 Patrick O. Wheatley

### Programs

#### B.S. Computer Science

#### M.S. Computer Science

The department offers a four-year program leading to the Bachelor of Science degree in Computer Science, as well as a graduate program leading to a Master of Science degree in Computer Science.

The undergraduate program provides an in-depth study of computer science fundamentals and practice. This material includes programming, operating systems, computer architecture, languages and translators, database systems, telecommunications, and software engineering.

Adequate numbers of elective units are provided so that students can specialize in various aspects of computation and its applications. Typical areas of emphasis are artificial intelligence, computer graphics, computer systems, scientific computation, business computation, computer hardware and computer simulation.

Practice is emphasized in addition to the study of theory and concepts. The curriculum is heavily project oriented and is designed to develop an ability to solve problems through efficient utilization of modern computer concepts. Students can expect to complete many assigned projects on a wide variety of computer systems and in a wide variety of programming languages. Students completing the course of study are exceptionally well-prepared to become practicing computer scientists. They are also well-prepared for graduate study.

During their last year of study, undergraduate students must complete a significant project experience through enrollment in the senior project, a two-quarter course. The project may be done either as an individual or as a member of a team.

Graduates of the computer science program are sought by the computer industry for positions as systems engineers, applications programmers, program analysts and sales representatives.

A wide variety of modern computing equipment is available on campus. Lower division courses are usually conducted using the equipment of the University Computer Services. These central campus resources consist of several mainframe and minicomputers in a time-sharing environment. Upper division courses are usually conducted using the facilities of the Computer Systems Laboratory. This laboratory, administered by the Computer Science Department, has a wide variety of mini- and micro-computers. It also houses a graphics laboratory and several research systems which provides an environment suitable for advanced studies.

The department has active student chapters of the Association for Computing Machinery, Upsilon Pi Epsilon (computer science honor society) and the Society for Computer Simulation.

**CURRICULUM IN COMPUTER SCIENCE**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
CSC 118 Fundamentals of Computer Science I (F.1.) .....	4		
CSC 218 Fundamentals of Computer Science II .....		3	
CSC 201 Advanced FORTRAN Programming II .....			3
CSC 221 Computer Principles and Programming .....			4
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
CHEM 124 General Chemistry .....			4
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
EL 219 Logic and Switching Circuits .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Electives .....	3	3	
	18	16	18
<b>Sophomore</b>			
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
MATH 204 Mathematics of Matrices or MATH 241 Analytic Geometry and Calculus .....	3-4		
CSC 245 Discrete Structures .....	3		
CSC 345 Data Structures .....	3		
MATH 242 Differential Equations .....		0-4	
CSC 340 Software Tools .....		4	
CSC 332 Numerical Analysis I .....			3
CSC 346 File Structures.....			3
PHYS 131, PHYS 132, PHYS 133 General Physics (B.1.a.) .....	4	4	4
CSC 304 Introduction to Digital Computer Architecture .....			4
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> Electives .....	0-1	0-4	
	17	18	17
<b>Junior</b>			
CSC 351 Programming Languages I: Design .....			3
CSC 353 Computer Systems Programming .....	3		
CSC 453 Introduction to Operating Systems .....		4	
ECON 211 Principles of Economics (D.3.) .....		3	
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
<sup>2</sup> Critical reading electives (C.1.) .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
BIO 220 Physiology and Biological Adaptation (E.2.) .....	4		
STAT 321, STAT 322 Statistical Analysis (B.2.) .....		3	3
<sup>2</sup> Life sciences elective (B.1.b.) .....		3	
<sup>1</sup> Electives .....	3		2
	16	16	15

Senior	F	W	S
CSC 450 Programming Languages II: Description and Analysis .....		3	
CSC 451 Programming Languages III: Compiler Implementation .....			3
CSC 404 Telecommunications and Distributed Systems .....		4	
CSC 440 Software Engineering .....	3		
CSC 461, CSC 462 Senior Project .....	2	3	
CSC 347 Introduction to Database Systems.....			4
CSC 463 Undergraduate Seminar .....	2		
PSY 201/PSY 202 General Psychology (E.I.) .....		3	
<sup>2</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	3		3
<sup>1</sup> Electives .....	6	3	5
	16	16	15

<sup>1</sup> At least 15 units must be selected with the approval of the student's adviser in one field in which computer science is applied.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)



## MASTER OF SCIENCE IN COMPUTER SCIENCE

The department offers a program leading to a Master of Science in Computer Science with particular emphasis in the following areas: computer systems and software, computer graphics, numerical analysis, computer modeling and simulation, expert systems, information processing and computer architecture. The program is designed for maximum flexibility to allow the student to concentrate in one particular area of study or to blend coursework in several areas. Graduate lectureships for quarter-time teaching assignments are generally available, but are usually awarded to students already in residence. Special features of the program include its emphasis on applications of computers to current industrial problems.

A close association with industry is typified by the practicum, which involves students and their advisers in a problem of interest to a specific industrial organization, and the School of Engineering Student/Faculty internship program, which provides for individual contracting of students with a specific company.

All students are required to complete a thesis or a practicum. These are scholarly investigations or projects which culminate students' classroom and laboratory learning. The theses and practica allow students to demonstrate in practice their mastery of the field of computer science.

In addition to the several systems provided by the University Computer Services, the department has its own Computer Systems Laboratory. The laboratory is generously supported by industry and includes a Xerox 8000 system with 32 workstations, a Pyramid UNIX super minicomputer system and a wide variety of mini- and microcomputer systems.

Outstanding students who did not major in computer science at the undergraduate level are encouraged to apply for admission and finish the prerequisites for graduate work before beginning the program requirements.

The Graduate Record Examination (GRE) is required of all applicants. Foreign applicants must also take the TOEFL exam. For admission as a classified graduate student, an applicant must hold a bachelor's degree in computer science or a closely related technical field with a minimum grade point average of 3.0 in the last 90 quarter units (60 semester units) attempted and must have satisfactory scores on the GRE (and TOEFL if applicable). Applicants meeting these standards, but with a bachelor's degree in a field not closely related to computer science, may be admitted as conditionally classified students and must complete all prerequisite course work before advancement to classified graduate standing. Advancement to Candidacy requires approval of an advisory committee and completion of 12 units of course work specified in the student's formal program of study with a minimum grade point average of 3.0.

The student must take at least 45 units of work beyond the undergraduate degree chosen to include:

### CURRICULUM FOR THE MASTER OF SCIENCE DEGREE IN COMPUTER SCIENCE

	<i>Units</i>
Core sequence of required courses:.....	15
CSC 501 Language and Translators (4)	
CSC 502 Database Systems (4)	
CSC 503 Operating Systems (4)	
CSC 590 Graduate Seminar (3)	
Restricted electives to be selected from:.....	8
CSC 504, CSC 505, CSC 506, CSC 507, CSC 517, CSC 570	
Thesis, project, or practicum.....	6
CSC 599 Thesis/Project (2-3) (2-3) or	
CSC 559, 560 Practicum in Computer Science I, II (1) (5)	
Electives to be selected with adviser's approval.....	16
	45

For further information or advisement students should communicate with the Graduate Coordinator of the Computer Science Department.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Computer Science and other subjects.

## ELECTRONIC AND ELECTRICAL ENGINEERING DEPARTMENT

### Faculty

#### Department Head, James G. Harris

Richard A. Bucich	Michael J. Fitzpatrick	Jacques C. Sabto
Thomas T. L. Chou	Saul Goldberg	Terry R. Stanhope
Michael M. Cirovic	Harry Hazebrook	Shyama C. Tandon
Edward J. Clerkin	William F. Horton	James H. W. Tseng
Clifford B. Cloonan	John W. McCombs	Gustav N. Wassel
S. K. Datta	Wayne E. McMorran	Donley J. Winger
Art Dickerson	Shien-Yi Meng	Michael T. Wollman
Richard K. Dickey	Ahmad Nafisi	Chuan-Sung Yeh
Eugene D. Fabricius	Doug Rosener	

### Programs

#### B.S. Electrical Engineering

#### B.S. Electronic Engineering

The Electronic and Electrical Engineering Department offers two degree programs which are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology: the Bachelor of Science degree in Electronic Engineering and the Bachelor of Science degree in Electrical Engineering. When applying for admission, one of the two majors must be selected. These two majors have identical curricula through the sophomore year with minor differences in the junior year. Consequently, the student may elect a major change from one to the other as late as the junior year.

The main objective of the department is to prepare the student for engineering; i.e., pursuing solutions to urgent problems in reshaping the environment to meet human needs while being responsibly aware of all implications. The curriculum provides a sound theoretical background along with current, practical engineering knowledge. The student begins the major in the first quarter with orientation and generally has one or more major courses each quarter until graduation. The many laboratory courses provide practical experience and lead logically into design which begins in the third year.

Senior students select specialized technical courses which make them more attractive to industry as early contributors. The student wishing to pursue graduate work may select appropriate senior courses in keeping with this goal. In the required senior design project, students demonstrate their understanding of engineering knowledge and their ability to apply that knowledge creatively to practical problems. Learning in the humanities and the social sciences extends over all years.

Students are encouraged to participate in appropriate professional clubs such as: Eta Kappa Nu, Amateur Radio Club, Audio Engineering Society, the Electronic and Electrical Engineering Council, the Student Branch of the Institute of Electrical and Electronics Engineers (IEEE), International Society of Hybrid Microelectronics (ISHM), Society of Photo-Optical Instrumentation Engineers (SPIE), Poly Phase Club, and Power Engineering Society.

#### GRADUATE PROGRAMS

For information regarding the Master of Engineering degree program with primary fields of study in computer engineering, electrical engineering, and electronic engineering, please see page 211 of this catalog.



**BASIC CURRICULUM**

The first two years of the Electronic Engineering and Electrical Engineering curricula introduce the student to material basic to both of these disciplines.

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
EE 110 Orientation .....	1		
EE 112 Basic Circuit Analysis .....			2
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
CSC 101 Fortran Programming .....	2		
ETMP 157 Electronic Manufacturing .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
	18	18	17

**Sophomore**

EE 211, EE 212 Basic Electric Circuit Analysis .....	3	3	
EE 241, EE 242 Basic Circuits Laboratory .....	1	1	
EL 207 Introduction to Electric and Magnetic Fields .....	3		
EL 208, EL 248 Electronic Devices and Laboratory .....			4
EL 219 Logic and Switching Circuits .....			3
CSC 311 Numerical Engineering Analysis (F.1.) .....			3
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
MATH 317 Topics in Engineering Mathematics (B.2.) .....			4
PHYS 211 Modern Physics .....		4	
ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....		4	
MET 306 Materials Engineering .....	3		
ECON 201/ECON 211/ECON 222 elective (D.3.) .....		3	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ....			4
	17	19	18

# CURRICULUM IN ELECTRICAL ENGINEERING

Electrical engineering is that branch of engineering which deals with industrial process control systems and with generation, distribution, control and utilization of electric power. The curriculum includes basic circuit, field and device theory accompanied by control systems and power system analysis. The curriculum is responsive to current technical advancements in engineering and science.

Senior elective courses provide specialized preparation in a selected area such as advanced control systems, energy conversion, power system analysis, protection and stability and solid state motor control.

The Electric Power Institute, sponsored by the university and underwritten by major utility companies and electrical equipment manufacturers, offers advanced seminars and lectures in the electrical power field and provides limited student and faculty exchange opportunities.

There are appropriate laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
EE 301 Network and System Analysis .....	3		
EE 341 Advanced Circuit Laboratory .....	1		
EE 302, EE 342 Linear Control Systems and Laboratory .....		4	
EE 303 Power Transmission .....			3
EE 325, EE 365 Energy Conversion Electromagnetics and Laboratory .....	4		
EL 307, EL 347 Digital Integrated Electronics and Laboratory .....	4		
EL 308, EL 348 Electronic Circuits and Laboratory .....		4	
EL 309, EL 349 Integrated Electronic Circuits and Laboratory .....			4
EL 319 Digital System Design .....		3	
EL 328 Discrete Time Systems .....		3	
EL 334 Electromagnetic Fields I .....			3
ME 302 Thermodynamics I .....		3	
ME 313 Heat Transfer .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
POLS 210 American and California Government (D.1.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
	18	17	16
<b>Senior</b>			
EE 406 Power System Analysis I .....	4		
EE 461, EE 462 Senior Project .....	3	2	
ME 341 Fluid Mechanics .....	3		
<sup>2</sup> Approved technical electives .....	3	6	5
<sup>1</sup> Critical reading electives (C.1.) .....		3	3
Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
HIST 315 Modern World History (D.2.) .....			3
	16	17	17

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> A minimum of two senior design laboratories with EL or EE prefixes and two design lecture courses in the major is required.

## CURRICULUM IN ELECTRONIC ENGINEERING

Electronic engineering is that branch of engineering which deals with the development, design and application of circuits, devices and systems for communication, computers, controls, information processing and display, and system instrumentation. The curriculum includes circuit, field and device theory accompanied by logic and switching circuit design. The program is responsive to current technical advancements in engineering and science.

Senior elective courses provide specialized preparation in a selected area such as active and passive network synthesis, advanced communications systems, computer system design, microelectronic circuit engineering, microprocessor systems applications, microwave engineering, and solid state devices.

There are appropriate laboratories equipped to support the program. They provide not only hands-on instrumentation experience, but also design experience.

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
EL 303, EL 343 Signal Transmission and Laboratory .....			4
EL 307, EL 347 Digital Integrated Electronics and Laboratory .....	4		
EL 308, EL 348 Electronic Circuits and Laboratory .....		4	
EL 309, EL 349 Integrated Electronic Circuits and Laboratory .....			4
EL 319 Digital System Design .....		3	
EL 334 Electromagnetic Fields I .....			3
EE 301 Network and System Analysis .....	3		
EE 341 Advanced Circuits Laboratory .....	1		
EE 302 Linear Control Systems .....		3	
EE 325, EE 365 Energy Conversion Electromagnetics and Laboratory .....	4		
ME 302 Thermodynamics .....		3	
ME 313 Heat Transfer .....			3
EL 328 Discrete Time Systems .....		3	
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
POLS 210 American and California Government (D.1.) .....			3
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	3	3	
	18	19	17
<b>Senior</b>			
EL 401 Electromagnetic Fields II .....	3		
EL 414 Signal Processing in Communications .....	3		
EL 461, EL 462 Senior Project .....	3	2	
<sup>2</sup> Approved technical electives .....	4	4	3
PHYS 412 Solid State Physics for Engineers .....	3		
PHYS 452 Solid State Physics Laboratory for Engineers .....		1	
<sup>1</sup> Critical reading electives (C.1.) .....		3	3
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
HIST 315 Modern World History (D.2.) .....			3
	16	16	15

See COURSES OF INSTRUCTION section of this catalog for description of courses in Electrical Engineering, Electronic Engineering, and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> A minimum of 2 senior design laboratories with EL or EE prefixes and two design lecture courses in the major is required.

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## ENGINEERING SCIENCE

### An Interdisciplinary Program

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#### Faculty

Coordinator, Peter Y. Lee

#### Programs

##### B.S. Engineering Science

The Bachelor of Science degree in Engineering Science is designed for those students seeking an education in the fundamental principles of engineering systems. It is an opportunity for each student (with the aid of an adviser) to establish a program to meet science oriented career objectives.

The engineering sciences, which are based upon an extensive study of mathematics, physics, and chemistry, are (1) mechanics of solids and fluids, (2) electrical science including electric and magnetic fields, circuits, and electronics, (3) thermodynamics and statistical mechanics, (4) materials science, (5) information transmission, (6) logic and computing devices, (7) systems analysis, and (8) transfer and rate processes, including heat and mass transfer.

The engineering science program contains 27 units of electives in order to emphasize particular areas of engineering science. Programs which may be chosen for emphasis include the traditional fields of engineering physics, biomedical engineering, geological engineering, ocean engineering, and atmospheric science. In addition to these areas, the Cal Poly engineering science program places special emphasis on biochemical engineering and modeling and simulation.

The biochemical engineering field of emphasis prepares engineering science students to interact with biochemists in helping to solve the production problems of the biochemical industries. Graduates with this background are prepared to deal with industrial problems relating to separation processes, scale-up, mass and heat transfer, bioreactors and sterilization when working with fermentation processes and other types of biological processes.

Graduates with the modeling and simulation field of emphasis are prepared to interact with a variety of engineering disciplines in the modeling of engineering systems through large scale simulation.

Prior to the end of the first quarter of the junior year, the student will be required to submit to the Coordinator a "study plan" of electives. This plan must be consistent with a clearly defined career goal.

Please note that the engineering science major is *not* appropriate for those students who are still undecided on a particular field of engineering as a career objective.

#### GRADUATE PROGRAMS

For information regarding the Master of Engineering degree program with several primary fields of study, please see page 211 of this catalog.

**CURRICULUM IN ENGINEERING SCIENCE****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
CSC 101 Fortran Programming (F.1.) .....			2
<sup>1</sup> Manufacturing processes electives .....		2	2
EE 112 Basic Circuit Analysis .....			2
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ....	4		
	<u>16</u>	<u>17</u>	<u>17</u>

**Sophomore**

ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....		4	
CE 204, CE 205, CE 206 Strength of Materials and Laboratory ....		3	3
EE 211, EE 241 Basic Electric Circuit Analysis and Laboratory ....	4		
EE 212, EE 242 Basic Electric Circuit Analysis and Laboratory ....		4	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
MATH 317 Topics in Engineering Mathematics (B.2.) .....			4
PHYS 133 General Physics .....	4		
PHYS 210 Introduction to Modern Physics or PHYS 211 Modern Physics .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
	<u>18</u>	<u>18</u>	<u>17</u>

**Junior**

EE 301 Network and System Analysis .....		3	
EE 341 Advanced Circuits Laboratory .....		1	
EL 208, EL 248 Electronic Devices and Laboratory .....			4
MET 306, MET 341 Materials Engineering and Laboratory .....	4		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
POLS 210 American and California Government (D.1.) .....	3		
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....			3
<sup>3</sup> Mathematics, statistics or computer science elective .....			3
CSC 332 Numerical Analysis I .....		3	
ME 302, ME 303 Thermodynamics .....	3	3	
ME 313 Heat Transfer .....		3	
ME 316, ME 317 Mechanical Vibrations and Laboratory .....	4		
<sup>2</sup> Critical reading elective (C.1.) .....			3
<sup>4</sup> Required and elective courses to complete major .....	4		5
	<u>18</u>	<u>17</u>	<u>18</u>

Senior

	F	W	S
MET 301 Physical Properties of Materials .....		3	
<sup>5</sup> Senior Project .....		2	2
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
PHIL 331/PHIL 335/PHIL 337/HUM 402 (C.3.) .....		3	
ME 341 Fluid Mechanics .....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>4</sup> Required and elective courses to complete major .....	8	6	4
HIST 315 Modern World History (D.2.) .....	3		
<sup>2</sup> Critical reading elective (C.1.) .....	3		
Electives.....		3	3
	17	17	18

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Engineering and other subjects.

- <sup>1</sup> To be selected from ETMP 144, ETWT 144, 152; IT 302.
- <sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)
- <sup>3</sup> To be selected from MATH 312, MATH 319, MATH 405, MATH 408, STAT 321, CSC 311, CSC 331, CSC 333, CSC 360.
- <sup>4</sup> Emphasis area elective units must be chosen with the approval of the adviser.
- <sup>5</sup> To be selected in an appropriate engineering discipline.



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## ENGINEERING TECHNOLOGY DEPARTMENT

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### Faculty

#### Department Head, William R. Backer

Franklin P. Abshire  
Kenneth L. Brown  
Nan A. Byars  
Archie D. Cheda  
Mark A. Cooper  
Kim Davis  
James R. Ehrenberg

Fred S. Friedman  
Gary A. Granneman  
Stephen L. Hanes  
Michael Hawes  
William R. Hodges  
Thomas D. Kay

M. Zahir Khan  
Karl D. Lilje  
Krishna N. Patel  
John C. Peterson  
Robert L. Rogers  
Richard A. Strahl

### Programs

B.S. Engineering Technology with Options in:

Air Conditioning–Refrigeration  
Technology  
Electronic Technology

Manufacturing Processes Technology  
Mechanical Technology  
Welding Technology

The Technology Accreditation Commission of the Accreditation Board for Engineering and Technology (TAC/ABET) defines engineering technology as follows: "Engineering technology is that part of a continuum extending from the craftsman to the engineer. Located nearest the engineer, it requires the application of scientific and engineering principles in support of engineering activities."

The engineering technologist is somewhat more specialized than the engineer, focusing on a technical field within a traditional discipline. This is done by selecting an option in the Engineering Technology Department and choosing complementary technical electives. Compared to engineering, there is less breadth and depth in underlying engineering sciences, mathematics, and basic sciences. There is more training in skills and knowledge related to production, design support, equipment selection and modification, service, and maintenance. Emphasis is given to application of existing technology.

The program is structured to optimize transfer credit from associate technology programs offered by the California community colleges. The majority of the students in the program have transferred from these institutions.

The curriculum begins with a core of courses including mathematics, science, drafting, manufacturing processes, and mechanical, electrical, and materials fundamentals. Each student selects an option (listed below) for specialization. Finally, technical electives are selected from four groups, with the adviser's approval, to permit individual career orientation. All five options are accredited by TAC/ABET.

The Bachelor of Science in Engineering Technology leads to careers in manufacturing, quality assurance, design support, field service, product testing and evaluation, maintenance, technical aspects of marketing, and other areas of technical support of engineering activity.

**CURRICULAR OPTIONS****Air Conditioning-Refrigeration Technology**

Emphasizes heating, ventilating, air distribution controls, building sanitation, air conditioning and refrigeration systems; specifically, the areas of modern commercial, industrial and manufacturing system applications utilizing the latest energy conservation techniques.

**Electronic Technology**

Emphasizes application of state-of-the-art technology, both analog and digital, used in computers, controls, communications systems, industrial electronics, and instrumentation.

**Manufacturing Processes Technology**

Emphasizes the technologies of manufacturing systems, including computer aided methods, numerical control, production tooling and material handling, as well as the study of the processes and ancillary support systems of modern manufacturing.

**Mechanical Technology**

Emphasizes the application of current technology in support of design of mechanical equipment and systems; also fluid power, engines, process control, and product evaluation and modification.

**Welding Technology**

Emphasizes welding techniques, nondestructive testing, power sources, production equipment and problems, and welding process control in both construction and industrial environments.

**GRADUATE PROGRAMS**

For information regarding the Master of Engineering degree program with several primary fields of study, please see page 211 of this catalog.

**CURRICULUM IN ENGINEERING TECHNOLOGY****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
ETEL 124 Introduction to Electronic Circuits .....	4		
ETEL 125 Introduction to Electronic Devices .....		4	
ETEL 126 Electrical Practices .....			4
<sup>1</sup> Manufacturing Processes electives .....	2	1	2
<sup>1</sup> Engineering drawing electives .....	2	1	1
MATH 120 College Algebra and Trigonometry .....	5		
MATH 131, MATH 132 Technical Calculus (B.2.) .....		4	4
PHYS 121, PHYS 122 College Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
<sup>2</sup> Digital computer programming (F.1.) .....			2
	17	17	17

**Sophomore**

IE 222 Engineering Analysis .....		3	
<sup>1</sup> Digital computer programming .....	2		
ETME 205 Statics for Engineering Technology .....	3		
ETME 206 Dynamics for Engineering Technology .....		4	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ...			4
PHYS 123 College Physics .....	4		
CHEM 121 General Chemistry (B.1.a.) .....		4	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
MET 235 Metallurgy for Engineering Technology .....			4
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>2</sup> Critical reading elective (C.1.) .....			3
MATH 133 Technical Calculus .....	4		
Courses to complete major .....		3	4
	17	17	18



	F	W	S
<b>Junior</b>			
ETME 301 Thermodynamics for Engineering Technology .....	4		
<sup>2</sup> Critical reading elective (C.1.) .....	3		
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
<sup>1</sup> Approved technical electives .....	3	3	4
Courses to complete major .....	4	8	4
	17	17	17
<b>Senior</b>			
ET 461, ET 462 Senior Project .....	2	3	
ET 463 Undergraduate Seminar .....	2		
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....		3	
BUS 404 Governmental and Social Influences on Business			
(D.4.b.) .....			4
HUM 402 Values and Technology or			
PHIL 337 Professional Ethics (C.3.) .....			3
IE 403 Principles of Engineering Economics.....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Approved technical electives .....	4	4	4
Courses to complete major .....	6	4	6
	17	17	17

<sup>1</sup> To be selected with approval of adviser.

<sup>2</sup> To be selected in accordance with the General Education-Breadth and TAC/ABET requirements. Skills courses are not acceptable. (Please see page 98 of this catalog.)

## AIR CONDITIONING-REFRIGERATION TECHNOLOGY OPTION

(Add courses below to basic curriculum)

<b>Sophomore</b>	ETAC 301 Computer Aided HVAC .....	(3)
ETAC 121 Air Conditioning and	ETAC 321 Air Distribution Systems .....	(3)
Refrigeration Principles .....	ETAC 331 Refrigeration Systems .....	(4)
ETAC 123 Environmental Graphics .....		(3)
<b>Junior</b>	<b>Senior</b>	
ETAC 201 Air Conditioning and	ETAC 332 Refrigeration Systems .....	(4)
Refrigeration Codes .....	ETAC 339 Heat Exchanger Technology..	(3)
ETAC 221 Mechanical Equipment of	ETAC 425, ETAC 426 Air Conditioning	
Buildings .....	Systems .....	(8)
		(3)

## ELECTRONIC TECHNOLOGY OPTION

(Add courses below to basic curriculum)

<b>Sophomore</b>	ETEL 312 Active Linear Circuits .....	(4)
ETEL 218 Digital Circuits I .....		(3)
ETEL 231 Passive Network Analysis .....		(4)
<b>Junior</b>	<b>Senior</b>	
ETEL 232, ETEL 233 Electronic Circuits	ETEL 334 Digital Circuits II .....	(4)
and Devices .....	ETEL 335 Communications I .....	(4)
ETEL 311 Transmission Lines and	ETEL 338 Introduction to Computer	
Antennas .....	Technology .....	(4)
	ETEL 435 Communications II .....	(4)
		(4)

## MANUFACTURING PROCESSES TECHNOLOGY OPTION

(Add courses below to basic curriculum)

### Sophomore

ETMP 224 Advanced Machining  
Technology ..... (4)

ETMP 245 Advanced Machining  
Operations ..... (3)

### Junior

EMTE 320 Mechanisms ..... (3)

ETME 344 Advanced Design Drawing .. (2)

ETMP 321, ETMP 322 Tool Design ..... (6)

ETMP 325 Abrasive Machining and  
Finishing ..... (2)

IE 214 Production Control ..... (2)

IE 233 Computer Aided Manufacturing (2)

### Senior

ETMP 336 Numerical Control  
Programming ..... (3)

ETMP 421 Computer Aided  
Manufacturing Technology ..... (3)

ETMP 434, ETMP 435, ETMP 436 Tool  
and Manufacturing Engineering ..... (9)

## MECHANICAL TECHNOLOGY OPTION

(Add courses below to basic curriculum)

### Sophomore

ETAC 221 Mechanical Equipment of  
Buildings ..... (3)

IT 302 Plastic Design ..... (2)

ETME 335 Selection of Engineering  
Materials ..... (2)

### Junior

ETME 320 Mechanisms ..... (3)

ETME 333 Industrial Hydraulics and  
Pneumatics ..... (4)

ETME 337 Instrumentation of  
Mechanical Systems ..... (3)

ETME 338 Industrial Engines ..... (4)

ETME 344 Advanced Design Drawing .. (2)

### Senior

ETME 421, ETME 422 Applied Machine  
Design ..... (8)

ETME 437 Applied Fluid Power Systems (4)

ETME 443 Mechanical Systems ..... (4)

## WELDING TECHNOLOGY OPTION

(Add courses below to basic curriculum)

### Sophomore

CHEM 122 General Chemistry ..... (4)

ETWT 224 Weld Evaluation Methods .. (2)

ETWT 259 Advanced Welding ..... (2)

### Junior

ETWT 324, ETWT 325, ETWT 326  
Welding Technology ..... (12)

ETWT 335 Nondestructive Examination (5)

### Senior

ETWT 336 Welding Power Sources ..... (3)

ETWT 434, ETWT 435, ETWT 436  
Advanced Welding Technology ..... (11)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Engineering Technology and other subjects.

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## INDUSTRIAL ENGINEERING DEPARTMENT

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### Faculty

#### Department Head, Donald E. Morgan

J. Kent Butler  
H. JoAnne Freeman

Anthony K. Mason  
Unny Menon

A. Reza Pouraghabagher  
Ahmad K. Seifoddini

### Programs

#### B.S. Industrial Engineering

Industrial Engineering is the profession concerned with solving engineering and management problems by applying scientific logic and by utilizing energy, materials, facilities, and personnel most effectively. Its objective is to improve quality and efficient production of goods and services for humankind and to act as the interface between technology and the human factor. Engineering methods and practical knowledge are used in formulating decision models for optimum application of management principles.

Industrial engineering graduates can choose from a most challenging range of career activities: operations research and analysis, production planning and scheduling, plant design, management, human factors engineering design, data processing and analysis, measurement, quality control and reliability assurance, technical economic planning, resource conservation, productivity measurement, increasing productivity using computer integrated manufacturing techniques, robotics, and, in general, systems analysis and design. The physical, engineering, and social sciences form the broad base for these endeavors.

The curriculum leading to the Bachelor of Science in Industrial Engineering degree, accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, is oriented to provide graduates with the capability of producing results with a minimum of additional training. Graduates also are well prepared for successful postgraduate study. Health care industries, banks, retail chains, farms, airlines, mines, computer firms, as well as government and traditional manufacturing industries, employ graduates of this discipline. There are active student chapters of the American Institute of Industrial Engineers; Alpha Pi Mu, the national honorary society for industrial engineers; Omega Rho, the national honor society for operations research; and APICS, the American Production and Inventory Control Society.

Department and university laboratories and equipment, including computers and programmable processors, are integrated into course work from matriculation until graduation to investigate, test, and apply theoretical principles learned in the classroom.

#### GRADUATE PROGRAMS

For information regarding the Master of Engineering degree program with a primary field of study in industrial engineering, please see page 211 of this catalog.

CURRICULUM IN INDUSTRIAL ENGINEERING

Freshman	F	W	S
IE 101 Introduction to Industrial Engineering .....	2		
IE 121 Industrial Systems Analysis .....		2	
IE 131 Work Measurement and Design .....			3
IE 233 Computer-Aided Manufacturing .....			2
Manufacturing processes elective .....		1	
ETMP 144 Manufacturing Processes .....	2		
ETME 142, ETME 143 Engineering Drawing Systems .....	1	1	
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ....			4
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
SOC 105 Introduction to Sociology (D.4.a.) .....		3	
	17	18	17
Sophomore			
IE 239 Industrial Costs and Controls .....	4		
IE 314 Engineering Economy .....			3
IE 316 Microcomputers as Control Devices .....		2	
IE 334 CAD/CAM .....			3
ETMP 145 Manufacturing Processes: Machining II or IT 141 Plastics Processes and Applications .....			1
ME 211 Engineering Statics .....			3
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
PHYS 131, PHYS 132, PHYS 133 General Physics (B.1.a.) .....	4	4	4
POLS 210 American and California Government (D.1.) .....	3		
ECON 201 Survey of Economics (D.3.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
ENGR 251 Digital Computer Applications (F.1.) .....		2	
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
	18	18	17
Junior			
IE 251 Manufacturing Engineering Laboratory .....	4		
IE 304, IE 305 Operations Research I and II .....	3	4	
IE 312 Data Management Systems Design.....		3	
IE 343 Facilities Design .....			4
IE 319 Human Factors Engineering I .....	3		
IE 326, IE 426 Engineering Test Design and Analysis I and II .....		3	3
IE 407 Algorithmic Systems Analysis.....			4
STAT 321 Statistical Analysis (B.2.) .....	3		
ME 212 Engineering Dynamics .....		4	
EE 201, EE 261 Electric Circuits Theory and Laboratory .....			4
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....	4		
HIST 315 Modern World History (D.2.) .....		3	
<sup>2</sup> Technical elective.....			3
	17	17	18

Senior	F	W	S
IE 430 Statistical Quality Control .....	3		
IE 441, IE 442 Fundamentals of Supervision .....	2	1	
IE 410 Inventory Control Systems .....	4		
IE 461, IE 462 Senior Project .....	2	3	
IE 411 Production Systems Analysis .....		3	
IE 463 Undergraduate Seminar .....			2
IE 420 Simulation Design and Analysis.....			4
ME 302 Thermodynamics .....		3	
CE 204 Strength of Materials or			
ME 341 Fluid Mechanics.....			3
EL 321 Electronics .....	3		
<sup>1</sup> Critical reading electives (C.1.) .....		4	4
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>2</sup> Technical elective.....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
	17	17	19

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Industrial Engineering and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth and A.B.E.T. requirements. (Please see page 98 of this catalog.)

<sup>2</sup> Choose from the following: IE 409, IE 421, IE 425, IE 437 or current listing.

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## MECHANICAL ENGINEERING DEPARTMENT

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### Faculty

#### Department Head (Position Vacant)

James G. Andresen  
Edward H. Baker  
Ernest W. Blattner  
William E. Clark  
Otto C. Davidson  
Edward R. Garner  
Harold E. Gascoigne  
Raymond G. Gordon  
Michael A. Iannce

Rodney G. Keif  
Don C. Lemmon  
James G. LoCascio  
Fredrick B. Malmborg  
Donald R. Mash  
Amrollah Mehdizadeh  
Safwat M. A. Moustafa  
Ronald S. Mullisen  
Lawrence H. Nelson

Saeed Niku  
Philip W. B. Niles  
William B. Patterson  
D. John Price  
Ramesh T. Shah  
Edward O. Stoffel  
Jack D. Wilson  
Yuen Cjen Yong

### Programs

B.S. Mechanical Engineering with Concentrations in:

Heating, Ventilating, Air  
Conditioning, and Solar

General  
Petroleum

The Bachelor of Science degree in Mechanical Engineering concerns itself primarily with the design, construction, and use of a wide variety of equipment ranging from manufacturing machinery and power generation equipment to consumer goods. Of primary concern to the mechanical engineer is the proper application of rigid, fluid, and thermal mechanics in the design, manufacturing, and use of this equipment.

Graduates obtain employment primarily with manufacturers, contractors, public utilities, and governmental agencies. Types of work performed by graduates include design, engineering sales, engineering testing, supervision of manufacture and erection.

The curriculum gives the student a thorough grounding in mechanical engineering and a choice of a curricular concentration in heating, ventilating, air conditioning and solar engineering (HVAC/solar) or petroleum engineering or in general professional specialties as approved by the adviser. Engineering courses are found in all four years. In the junior and senior years, the professional specialties include such courses as turbomachinery, mechanical design, heat and mass transfer, mechanical control systems, and solar systems. The curriculum is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

Laboratories are an important part of the student's education. The student is enrolled in mechanical engineering laboratories from the beginning of the freshman year until graduation. These laboratories include work in power generation, fluid flow, heat transfer, vibration, strength of materials, and others.

There are five organized student clubs associated with Mechanical Engineering: student branches of the American Society of Mechanical Engineers, the Society of Petroleum Engineers, the Society of Automotive Engineers, and the American Society of Heating, Refrigerating and Air Conditioning Engineers, and the Alternative Energy Club. These clubs offer students an active program of professional and social activity.

## CURRICULAR CONCENTRATIONS

### General

The term "general" is used to distinguish the variety of programs available under traditional mechanical engineering from the HVAC/solar concentration and petroleum concentration below.

### Heating, Ventilating, Air Conditioning, and Solar

This concentration prepares students to enter those phases of engineering dealing with thermal and solar systems and their control. These applications include: heating, ventilating and air conditioning of buildings; energy conservation and management; active and passive solar heating; and cooling and industrial refrigeration.

### Petroleum

This concentration places emphasis on the engineering necessary for the production and field development of petroleum reserves.

## GRADUATE PROGRAMS

For information regarding the Master of Engineering degree program with a primary field of study in mechanical engineering, please see page 211 of this catalog.

## CURRICULUM IN MECHANICAL ENGINEERING

### Freshman

	F	W	S
ME 134, ME 136 Mechanical and Thermal Systems .....	3	3	
ETME 141 Applied Descriptive Geometry .....	2		
ETME 142, ETME 143 Engineering Drawing I, II .....		1	1
<sup>1</sup> Manufacturing Processes electives .....		2	3
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131, PHYS 132 General Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
	17	18	18

### Sophomore

ENGR 251 Digital Computer Applications (F.1.) .....		2	
ME 211 Engineering Statics .....	3		
ME 212 Engineering Dynamics .....			4
CE 204, CE 205, CE 206 Strength of Materials and Laboratory ....		3	3
MET 306, MET 341 Materials Engineering and Laboratory .....			4
PHYS 133 General Physics .....	4		
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
MATH 318 Advanced Engineering Mathematics (B.2.) .....			4
ECON 201 Survey of Economics (D.3.) .....	3		
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
<sup>3</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
PSY 201/202 General Psychology (E.1.) .....		3	
	17	18	18

Junior	F	W	S
ME 327 Introduction to Design .....			5
ME 302, ME 303, ME 343 Thermodynamics I, II, and Laboratory .....	3	3	1
ME 341, ME 342, ME 345 Fluid Mechanics and Laboratory .....		3	4
ME 316, ME 317 Mechanical Vibrations and Laboratory .....		4	
ME 313 Heat Transfer .....		3	
EE 201, EE 261 Electric Circuit Theory and Laboratory .....	4		
EL 321, EL 361 Electronics and Laboratory .....		4	
IE 314 Engineering Economics .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
HIST 315 Modern World History (D.2.) .....			3
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) ....	4		
<sup>2</sup> Required and elective courses to complete major .....			4
	18	17	17
Senior			
ME 422 Mechanical Control Systems .....	4		
ME 461, ME 462 Senior Project .....	2	3	
ME 463 Undergraduate Seminar .....		2	
PHIL 230/PHIL 231 Philosophical Classics .....	3		
<sup>2</sup> Required and elective courses to complete major .....	8	7	8
<sup>3</sup> Critical reading electives (C.1.) .....		6	
<sup>3</sup> ART/MU/TH elective (C.2.) .....			3
<sup>3</sup> Literature, philosophy, arts elective (at least 3 units at 300-400 level) (C.3.) .....			6
	17	18	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Mechanical Engineering and other subjects.

<sup>1</sup> Chosen from ETMP 144; IE 141; ETWT 144; and either one unit of IT 141 or IT 327 (but not both).  
<sup>2</sup> 27 elective units must be chosen in a field of concentration. Concentration lists are available in the departmental office.  
<sup>3</sup> To be selected in accordance with General Education-Breadth and A.B.E.T. requirements. (Please see page 98 of this catalog.)



# METALLURGICAL ENGINEERING DEPARTMENT

## Faculty

**Department Head, George T. Murray**

William D. Forgeng  
Harry H. Honegger

Robert B. Leonesio

Daniel W. Walsh

## Programs

### B.S. Metallurgical Engineering

The Metallurgical Engineering Department prepares students for employment as metallurgical engineers, and also provides service courses in metallurgy to students in other departments. The Bachelor of Science degree in Metallurgical Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology. It offers an opportunity to pursue specialized metallurgical areas on an elective basis in the senior year.

Students who graduate as metallurgical engineers can continue on to graduate school but most are employed by private industry and government agencies to deal with problems of design and manufacture of metals and alloys, corrosion protection, nondestructive testing, application of materials to specific needs and requirements including process development. Typical position titles are metallurgist, metallurgical engineer, corrosion engineer, plant metallurgist, materials engineer, welding engineer, nondestructive test engineer, and quality assurance engineer.

The Metallurgical Engineering Department has well equipped laboratories which are used for studying welding, corrosion, x-ray diffraction, optical and electron microscopy, mechanical properties of metals, melting processes and heat treatment of alloys.

There is a student chapter of the following national professional societies: the American Society for Metals (ASM) and the American Institute of Mining and Metallurgical Engineers (AIME). The chapters offer an active program of professional and social activity.

### GRADUATE PROGRAMS

For information regarding the Master of Engineering degree program with a primary field of study in metallurgical engineering, please see page 211 of this catalog.

## CURRICULUM IN METALLURGICAL ENGINEERING

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
MET 121 Introduction to Metallurgical Engineering .....	1		
MET 122 Introduction to Metallurgical Engineering Laboratory ...			1
1 Manufacturing processes electives .....	2		2
ETME 142 Engineering Drawing I .....		1	
CHEM 124, CHEM 125 General Chemistry (B.1.a.) .....	4	4	
PHYS 131 General Physics (B.1.a.) .....			4
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ART 111 Introduction to Art (C.2.) .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
POLS 210 American and California Government (D.1.) .....		3	
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
	<b>18</b>	<b>18</b>	<b>18</b>

Sophomore	F	W	S
MET 306, MET 341 Materials Engineering and Laboratory .....	4		
MET 222, MET 223 Physical Metallurgy .....		4	3
ENGR 251 Digital Computer Applications (F.1.) .....		2	
ME 211 Engineering Statics .....		3	
ME 212 Engineering Dynamics .....			4
CE 204 Strength of Materials .....			3
PHYS 132, PHYS 133 General Physics .....	4	4	
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....			4
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
BIO 220 Physiology and Biological Adaptation (B.1.b., E.2.) .....		4	
	16	17	17
Junior			
MET 301 Physical Properties of Materials .....	3		
MET 302, MET 303 Mechanical Metallurgy .....		4	4
MET 324, MET 325, MET 326 Metallurgical Engineering .....	4	4	4
CE 205 Strength of Materials .....	2		
CE 206 Strength of Materials Laboratory .....	1		
STAT 321, STAT 322 Statistical Analysis .....	3	3	
ME 313 Heat Transfer .....			3
CHEM 305, CHEM 306 Physical Chemistry (B.1.a.) .....		3	3
HIST 315 Modern World History (D.2.) .....		3	
ENGL 230/ENGL 231 Masterworks of British Literature or			
ENGL 240 The American Tradition in Literature (C.1.) .....	4		
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....			4
	17	17	18
Senior			
MET 421, MET 422, MET 423 Metallurgical Thermodynamics .....	4	4	4
MET 424, MET 425, MET 426 Applied Metallurgical Engineering..	3	3	3
MET 440 Failure Analysis Laboratory .....	1		
MET 441, MET 442, MET 443 Metallurgy of Complex			
Alloys Laboratory .....	1	1	1
MET 434 Welding Engineering .....	3		
MET 461, MET 462 Senior Project .....	2	3	
EE 201, EE 261 Electric Circuits Theory and Laboratory .....		4	
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
HUM 402 Values and Technology (C.3.) .....			3
ECON 211 Principles of Economics (D.3.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
Free electives .....		3	
	17	18	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Metallurgical Engineering and other subjects.

<sup>1</sup> Select a total of 4 units from the following: ETWT 144; ETMP 144; ENGR 302.

<sup>2</sup> To be selected in accordance with the General Education-Breadth and EAC-ABET requirements. (Please see page 98 of this catalog.)





# School of Liberal Arts

## DEGREE PROGRAMS

B.S. Applied Art and Design .....	251
Graphic Design Option	
Photography Option	
B.A. English .....	254
B.A. History .....	260
B.S. Journalism.....	262
Agricultural Journalism Concentration	
Broadcast Journalism Concentration	
News-Editorial Concentration	
Public Relations Concentration	
B.A. Political Science .....	267
International Affairs Concentration	
Pre-Law Concentration	
Public Administration Concentration	
Teaching Concentration	
Urban Studies Concentration	
B.S. Social Sciences .....	270
Criminal Justice Concentration	
Cross-Cultural Studies Concentration	
Organizations Concentration	
Social Sciences (Teaching) Concentration	
Social Services Concentration	
B.A. Speech Communication.....	273
M.A. English.....	256

## MINORS

Dance .....	276
English .....	256
French .....	259
German.....	259
Linguistics .....	256
Music.....	265
Philosophy .....	266
Public Administration .....	269
Spanish .....	259
Speech Communication .....	275
Theatre .....	277

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## SCHOOL OF LIBERAL ARTS

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Jon M. Ericson, Dean

Bessie R. Swanson, Associate Dean

The School of Liberal Arts provides a record of man's experience and potential as a creative, imaginative, and reflective being. The school seeks to relate itself to the technological disciplines in a way that will help contribute to the solution of human problems. Accordingly, a wide range of courses is offered to serve every thoughtful man and woman without regard to specialized professional interests.

The school includes disciplines which represent four broad areas of knowledge: the fine and performing arts, communications, humanities, and social sciences. While the school has great breadth and diversity, unity is found in a study of the most engaging subject of all . . . man. Whether the focus is on imaginative man, political man, creative man, or rational man, there is a settled purpose: to help each student know herself or himself, to understand human values and human potential, and to understand our society and its institutions.

The eleven departments represented in the school are: Art and Design, English, Foreign Languages, History, Journalism, Music, Philosophy, Political Science, Social Sciences, Speech Communication, and Theatre and Dance. Bachelor's degree programs are offered in each department except Foreign Languages, Music, Philosophy and Theatre and Dance. Academic minors are offered in these latter four departments as well as in English, Linguistics, Public Administration, and Speech Communication. The English Department offers a Master of Arts degree.

Departmental offerings are supplemented by courses designated as Humanities. These courses, offered under the direction of a Humanities Coordinator, aim to heighten the student's sense of the interdisciplinary nature of humanistic studies and to increase awareness of humanistic values.

The School of Liberal Arts sponsors a London Study Program as a means to enrich the General Education and Breadth experience. Students and Cal Poly faculty live in London while they use the city's cultural resources as a laboratory for their study of the arts, humanities, and social sciences. Interested students are encouraged to discuss with their advisers a plan for meeting 12-15 units of GEB Area C and D requirements in a spring quarter, preferably in the sophomore or junior year.

In addition to extensive involvement in the instructional program, the school has a major responsibility for activities which enhance the cultural and intellectual environment of the campus. Active programs of exhibits and concerts are carried on in music and art, and a full range of dramatic production is staged in the theatre. Students with other talents are attracted to the school's cocurricular programs such as KCPR Radio, *Mustang Daily*, Model United Nations, Foreign Languages Club, creative writing contests, or intercollegiate forensics and debate. In addition, the school regularly sponsors an Arts and Humanities Lecture Series, a similar series with a focus on political science and supports both the Center for Practical Politics and the Center for the Arts.

## ART AND DESIGN DEPARTMENT

### Faculty

#### Department Head, (Interim) Robert Reynolds

Robert S. Densham  
Keith W. Dills  
Bernard W. Dusek  
Clarissa Hewitt  
Robert Howell

Charles W. Jennings  
George D. Jercich  
Eric B. Johnson  
Mary LaPorte  
John P. Mendenhall

Daniel D. Piel  
Pierre Rademaker  
Joanne Beaulieu Ruggles  
Henry Wessels

### Programs

#### B.S. Applied Art and Design with Options in:

##### Graphic Design

##### Photography

The Art and Design Department offers a four-year curriculum leading to the Bachelor of Science degree in Applied Art and Design. The curriculum prepares students for professional participation in the fields of graphic design or photography.

Both the graphic design and photographic options support creative and aesthetic growth and require the development of technical skills as a foundation for personal direction and enrichment. In support of the department's professional option and its continued commitment to the enhancement of nonart majors, a selection of courses is offered in the areas of art history and appreciation, studio art, and 3-dimensional design.

Because art and design are increasingly relevant to many professional fields, art courses are frequently required within various university majors and the department provides this service through a strong and diversified program.

In addition to the major and support programs, general education courses are available for all students who wish to enrich their understanding, appreciation, and practical skills.

### Curricular Options

#### Graphic Design <sup>1</sup>

Graphic design students are prepared for professional careers in visual communication encompassing such areas as corporate identity, publication design, advertising design, and packaging graphics. The curriculum emphasizes creative problem-solving, and addresses the development of specific skills in the design layout, and execution of graphic problems with supportive knowledge of reproduction limitations. Graphic design students have the unique opportunity, through course offerings in photography and graphic communications, to gain practical experience in production methods. Computer-assisted design courses utilizing the university's extensive CADAM facilities enhance the diversity of this option.

<sup>1</sup> The Graphic Design option of the Art and Design Department is distinguished from the Design Reproduction Technology option of the Graphic Communication Department. By focusing on creative problem solving, and development of design and layout skills, the Graphic Design option leads to positions such as graphic designer, art director and creative director for advertising agencies, design studios and corporate design departments. The Graphic Communication Department's Design Reproduction Technology option focuses on the technical and electronic aspects of transforming design into suitable fashion for reproduction in print media. The option leads to positions such as account executive, sales representative, estimator, production coordinator, and other positions requiring a technical understanding of design preparation and reproduction.

**Photography**

The photography option is a diversified, professionally oriented program in applied photography. Through these courses students gain expertise in technique, creativity, documentation and aesthetics in black and white and color photography. Visual literacy and problem-solving in photographic illustration/design are emphasized. Studies progress through a series of courses from basic photography to advanced commercial/illustration, utilizing large and small format cameras, color theory, electronic color analysis in color printing, studio speedlights, multi-media production and computer applications. The program also includes a study of the history of photography and the current photography marketplace.

**CURRICULUM IN APPLIED ART AND DESIGN**

<b>Freshman</b>		<b>F</b>	<b>W</b>	<b>S</b>
ART 101	Fundamentals of Drawing .....	3		
ART 131	2-Dimensional Design Fundamentals .....	3		
ART 132	Beginning Color Theory .....		3	
ART 133	Color and Design .....			3
ART 211	Art History: Prehistoric through the European Middle Ages .....			4
<sup>1</sup> ART 201	Intermediate Drawing or			
ART 222	35mm Intermediate B/W Photography .....			3
ART 221	Basic B/W Photography .....	3		
ENGL 125/PHIL 125/SPC 125	Critical Thinking (A.2.) .....			3
ENGL 114	Writing: Exposition (A.1.) .....		4	
PSY 201/PSY 202	General Psychology (E.1.) .....	3		
<sup>2</sup> Life sciences elective (B.1.b.) .....		4		
<sup>2</sup> Physical sciences elective (B.1.a.) .....			4	
<sup>2</sup> Physical or life sciences elective (with laboratory) (B.1.) .....				4
<sup>2</sup> Mathematics elective (B.2.) .....			3	
Elective .....			3	
		16	17	17
<b>Sophomore</b>				
ART 134	3-Dimensional Design I .....	3		
ART 135	3-Dimensional Design II .....		3	
ART 212	Art History: European Renaissance—Baroque Eras or			
ART 213	Art History: European 18th and 19th Century Art ...		4	
ART 311	Art History—Modern Art .....	4		
ART 224	35mm Advanced B/W Photography .....		3	
ART 228	35mm Color Slide Photography .....			2
MKTG 204/ECON 211/BUS 101/BUS 207.....				4
HIST 204	History of American Ideals and Institutions (D.1.) ...			3
<sup>1</sup> GRC 122	Design with Type (5) or			
GRC 227	Process Camera—Black and White (3) and			
GRC 337	Color Separation Systems (2) .....	3	2	
ENGL 218	Writing: Argumentation and Reports (A.4.) .....	4		
ECON 201	Survey of Economics or			
ECON 211	Principles of Economics (D.3.) .....			3
SPC 201	Public Speaking or			
SPC 202	Principles of Speech (A.3.) .....			3
Courses to complete major (option) .....		3	3	3
		17	15	18



	F	W	S
<b>Junior</b>			
ART 312 Art History—Contemporary Art .....	4		
<sup>1</sup> ART 314 History of Photography or			
ART 316 Design History .....			4-3
<sup>2</sup> Statistics elective (B.2.) .....		3	
ENGL 230/ENGL 231/ENGL 240 elective (C.1.) .....		4	
POLS 210 American and California Government (D.1.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
CSC 110 Computers and Computing (F.1.) .....			3
ENGL 251/ENGL 252/ENGL 253 Great Books of World			
Literature (C.1.) .....		3	
HIST 315 Modern World History (D.2.) .....			3
Electives .....		0-2	0-2
Courses to complete major (option) .....	7	4-6	3-4
	17	16	17
<b>Senior</b>			
ART 460 Professional Practices .....	2		
ART 461, ART 462 Senior Project .....		2	2
ART 463 Undergraduate Seminar .....			2
MU 101, MU 204 or TH 210 (C.2.) .....		3	
<sup>2</sup> Literature, philosophy, arts (except ART courses) electives			
(300-400 level) (C.3.) .....		3	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>2</sup> Technology elective (F.2.) .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
Electives .....	3	2	3
Courses to complete major (option) .....	6	6	3
	16	16	16

<sup>1</sup> Students in the Graphic Design Option take ART 201, GRC 122, ART 316 and students in the Photography Option take ART 222, GRC 227, GRC 337, ART 314.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

## GRAPHIC DESIGN OPTION

(Add Courses Below to Basic Curriculum)

<b>Sophomore</b>	ART 301 Advanced Drawing .....	(3)
ART 230 Beginning Graphic Design .....	GRC 223 Copy Preparation .....	(3)
ART 204 Watercolor .....		
GRC 222 Advanced Design with Type .....		
<b>Junior</b>	<b>Senior</b>	
ART 331, ART 332, ART 333 Graphic	ART 431, ART 432, ART 433 Advanced	
Design .....	Graphic Design .....	(9)
	ART 302 Life Drawing I or	
	ART 303 Life Drawing II .....	(3)
	ART 309 Illustration .....	(3)

## PHOTOGRAPHY OPTION

(Add Courses Below to Basic Curriculum)

<b>Sophomore</b>	ART 326 4x5 Camera/Commercial .....	(3)
ART 321 Creative B/W Photography ....	ART 327 Portraiture B/W .....	(3)
ART 322 Color Photography I,	ART 424 Multimedia Photography .....	(4)
Negative .....		
ART 323 Color Photography II,	<b>Senior</b>	
Positive .....	ART 426 Illustration Photography I,	
	B/W .....	(3)
<b>Junior</b>	ART 427 Illustration Photography II,	
ART 325 4x5 Camera Techniques,	Color .....	(3)
B/W .....	ART 428 Commercial Photography .....	(4)
	Approved electives in photography .....	(6)

# ENGLISH DEPARTMENT

## Faculty

Department Head (Interim), **Mona G. Rosenman**

Patricia A. Brenner	Robert J. Huot	Nancy Lucas
Carl R. V. Brown	Robert L. Inchausti	Robert McDonnell
Edward A. Cairns	Gloria Jameson	Michael P. Orth
Susan Currier	Starr Jenkins	David R. Rollings
Gordon Curzon	David J. Kann	Habib Sheik
Max E. Darnielle	Brent Keetch	James E. Simmons
Arthur H. Frieztsche	Alfred Landwehr	Douglas B. Smith
Katharine S. Gittes	Kathleen M. Lant	Charles W. Strong
Linda H. Halisky	Donald P. Lazere	Gerald J. Sullivan
John F. Harrington	Robert G. Lint	Michael J. Wenzl

## Programs

B.A. English	Minor: English
M.A. English	Minor: Linguistics

The English Department serves students through courses in writing, in literature, and in linguistics. The aim of the department is to provide students with greater expressive power, and with understanding and appreciation of literature. The department also endeavors to develop in students abilities valuable in the professional and business world and in private life: the abilities of reading critically, of organizing a large body of information, and of expressing the results in clear, forceful prose.

The department offers general education courses, courses for elective credit, minors in English and Linguistics, and the Bachelor of Arts and the Master of Arts programs. An English major or minor is valuable as preparation for law, for business, and for other careers in which handling and expressing ideas are essential. Students interested in an English or Linguistics minor should write or visit the department office for details.

## CURRICULUM IN ENGLISH

Freshman	F	W	S
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ENGL 215 Writing: Argumentation (A.4.) .....			4
ENGL 230, ENGL 231 Masterworks of British Literature (C.1.) .....		4	4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>1</sup> Mathematics elective (B.2.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
<sup>1</sup> Physical and life sciences electives (one with lab) (B.1.) .....	3	3	3
Electives .....	3	3	
	15	16	14

**Sophomore**

	F	W	S
ENGL 251, ENGL 252, ENGL 253 Great Books of World Literature (C.1.) .....	3	3	3
ENGL 290/ENGL 390/ENGL 395 .....		4	
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> Mathematics or statistics elective (B.2.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.a) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
ECON 201/ECON 211/ECON 222 elective (D.3.) .....			3
<sup>1</sup> Science, mathematics or statistics elective (B.2.) .....		3	
PHIL 311 History of Greek Philosophy (C.3.) .....	3		
Electives .....	4	3	
	16	16	15

**Junior**

ENGL 340, ENGL 341 American Literature .....	4	4	
ENGL 339 Introduction to Shakespeare .....			3
ENGL 330/ENGL 331/ENGL 332 British Literature .....	4	4	
ENGL 333/ENGL 334 British Literature .....			4
ENGL 302 Writing: Advanced Composition or			
ENGL 326 Literary Criticism .....	4		
ENGL 325 Creative Writing .....		4	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
CSC 110 Computers and Computing (F.1.) .....	3		
Electives .....		3	6
	15	15	16

**Senior**

ENGL 350/ENGL 351/ENGL 352 Modern Novel; Poetry, or Drama .....	3		
English elective (300–400 level) .....	4		
English electives (400 level) .....	4	8	8
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Technology elective (300–400 level) (F.2.) .....			3
ENGL 461 Senior Project .....	2		
Electives .....	3	6	4
	16	17	15

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

**CURRICULUM FOR ENGLISH MINOR***Units*

Required Courses .....	14
ENGL 253 Great Books (3)	
ENGL 302 Advanced Composition or	
ENGL 326 Literary Criticism (4)	
ENGL 339 Introduction to Shakespeare (3)	
ENGL 390 Modern English Grammar or	
ENGL 395 History of the English Language (4)	
Select <i>one</i> of the following British literature courses .....	4
ENGL 330 British Literature: Medieval Period	
ENGL 331 British Literature: The Renaissance	
ENGL 332 British Literature: The Enlightenment	
ENGL 333 British Literature: The Romantic Movement	
ENGL 334 British Literature: The Victorians	
Select <i>one</i> of the following American literature courses .....	4
ENGL 340 American Literature to 1860	
ENGL 341 American Literature 1860-1914	
ENGL 342 American Literature 1914 to the Present	
Select <i>one</i> of the following courses .....	3
ENGL 350 Modern Novel	
ENGL 351 Modern Poetry	
ENGL 352 Modern Drama	

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**CURRICULUM FOR LINGUISTICS MINOR***Units*

Required courses.....	7
ENGL 290 Introduction to Linguistics (4)	
ANT 333 Language and Culture (3)	
Language structuring courses.....	11
SPC 300 Phonetics (3)	
ENGL 390 Modern English Grammar (4)	
ENGL 395 History of the English Language (4)	
Choose one of the following areas of emphasis.....	7
<i>Language Development:</i>	
SPC 303 Development of Speech and Language (3)	
SPC 302 Introduction to Speech Disorders (4)	
<i>Orientation to Non-native Use of Language:</i>	
SPC 311 Cross-cultural Communication (3)	
ENGL 496 Introduction to Teaching English as a Second Language (4)	

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**MASTER OF ARTS DEGREE IN ENGLISH****General Characteristics**

This program includes the study of literary criticism, language, theory of composition, and literature. It is designed to provide students with the kind of knowledge and command of English that will prepare them specifically for 1) teaching English at the elementary, secondary, or community college levels; 2) employment in business, industry, and government service where specific communication skills are demanded; 3) self-directed development in writing; 4) graduate work at other institutions.

## Prerequisites

Admission with classified status requires that the student have a baccalaureate in English from an accredited institution (or the equivalent, as determined by the English Graduate Committee) and have maintained a grade point average of 3.0 for the last 90 quarter units (60 semester units). Advancement to candidacy requires approval of a formal program of study by the Graduate Committee, completion of 12 units with a grade point average of 3.0, and a satisfactory score on the Graduate Record Examination Advanced Test in English Literature. The GRE must be taken before the first 12 units are completed.

## Program of Study

The formal program of study must include the following: 1) 48 units of graduate work approved by the Director of Graduate Studies and the Graduate Committee; 2) a grade point average of 3.0 or better in all courses taken subsequent to admission; 3) two years of a foreign language (e.g., French, Spanish, German) or certification of the equivalent; 4) a comprehensive examination at the end of 48 units of study. The foreign language requirement must be satisfied before the comprehensive examination is taken. Students will elect an emphasis within the Master of Arts program: literature, linguistics, or writing.

## Applications

Applications for admission and requests for further information should be directed to the Director of Graduate Studies, English Department.

All applications should include a sample of expository writing.

## CURRICULUM FOR THE MASTER OF ARTS DEGREE IN ENGLISH

	<i>Units</i>
Required courses.....	28
ENGL 502 Seminar in Critical Analysis (4)	
ENGL 503 Seminar in English Linguistics (4)	
ENGL 505 Seminar in Composition Theory (4)	
ENGL 511 Seminar in American Literature (4) (4)	
ENGL 512 Seminar in British Literature (4) (4)	
English electives.....	16
Additional units in the English 400 and 500 series, selected with English Graduate Committee approval	
Electives .....	4
Elective units which may be taken at the 400 or 500 level in other departments, provided the English Graduate Committee approves	
	— 48

## Emphases

Within the 20 elective units listed above, students will choose, under advisement, a series of courses to complete one of these emphases:

- Literature—3 courses
- Linguistics—3 courses (which must include ENGL 504)
- Writing—3 courses

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in English and other subjects.

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## FOREIGN LANGUAGES DEPARTMENT

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### Faculty

Department Head, William Little

Odile Clause  
Oscar Ramírez

Bianca Rosenthal  
Verlan H. Stahl

Gloria Treviño

### Programs

Minor: French  
Minor: German

Minor: Spanish

The Foreign Languages Department offers a full undergraduate program in French, German and Spanish. Instruction at all levels emphasizes active language skills to prepare the student for technical, vocational, literary, and cultural needs in California, throughout the United States and abroad.

The department offers two programs which are designed to supplement all majors. The Certificate of Proficiency program is designed for students who wish to certify that they have achieved a broad, basic competence in grammar and culture. This program consists of 30 quarter units plus a comprehensive examination which tests speaking, listening, reading, writing, and culture.

In addition, the department offers minors in French, German, and Spanish. Each minor consists of 30 quarter units of course work specified by the department. A minimum of fifteen upper division units, including at least one 305 course, must be completed in residence and a minimum grade point average of 3.0 must be maintained. The minor is conferred concurrently with the baccalaureate degree. For general university requirements regarding minors, please see page 95 of this catalog. Information and application forms for the declaration of a French, German, or Spanish minor are available in the Foreign Languages Department.

**CURRICULUM FOR FRENCH MINOR***Units*

Required courses .....	23
FR 201, FR 202, FR 203 Intermediate French (3) (3) (3)	
FR 221, FR 222, FR 223 French Conversation (2) (2) (2)	
FR 301 Advanced French Composition and Grammar (4)	
FR 305 Significant Writers in French (4)	
Electives to be chosen from the following: .....	7
FR 302 Advanced French Conversation and Grammar (4)	
FORL 303 Culture (French) (3)	
FORL 401 Translation (French) (4)	
FR 405 French Literature in English Translation (3) (taken in conjunction with at least 1 unit of FR 470)	
FR 470 Selected Advanced Topics (1-4) (repeatable to 8)	
	30

**CURRICULUM FOR GERMAN MINOR**

Required courses .....	23
GER 201, GER 202, GER 203 Intermediate German (3) (3) (3)	
GER 221, GER 222, GER 223 German Conversation (2) (2) (2)	
GER 301 Advanced German Composition and Grammar (4)	
GER 305 Significant Writers in German (4)	
Electives to be chosen from the following: .....	7
GER 302 Advanced German Conversation and Grammar (4)	
FORL 303 Culture (German) (3)	
FORL 401 Translation (German) (4)	
GER 405 German Literature in English Translation (3) (taken in conjunction with at least 1 unit of GER 470)	
GER 470 Selected Advanced Topics (1-4) (repeatable to 8)	
	30

**CURRICULUM FOR SPANISH MINOR**

Required courses .....	23
SPAN 201, SPAN 202, SPAN 203 Intermediate Spanish (3) (3) (3)	
SPAN 221, SPAN 222, SPAN 223 Spanish Conversation (2) (2) (2)	
SPAN 301 Advanced Spanish Composition and Grammar (4)	
SPAN 305 Significant Writers in Spanish (4)	
Electives to be chosen from the following: .....	7
SPAN 302 Advanced Spanish Conversation and Grammar (4)	
FORL 303 Culture (Hispanic) (3)	
SPAN 323 Spanish Phonetics (3)	
SPAN 330 Advanced Spanish Grammar for the Bilingual Student (4)	
FORL 401 Translation (Spanish) (4)	
SPAN 405 Hispanic Literature in English Translation (3) (taken in conjunction with at least 1 unit of SPAN 470)	
SPAN 470 Selected Advanced Topics (1-4) (repeatable to 8)	
	30

HISTORY DEPARTMENT

Faculty

Department Head, Max E. Riedlsperger

Timothy M. Barnes	Donald A. Grinde, Jr.	Edward L. Mayo
Lloyd N. Beecher	Barbara M. Hallman	Barton C. Olsen
Robert E. Burton	Donald W. Hensel	John G. Snetsinger
George B. Cotkin	Daniel E. Krieger	Quintard Taylor, Jr.

Programs

B.A. History

The History Department offers a Bachelor of Arts degree built on a broad social science and humanities base. In addition, the department offers a broad range of courses on Europe, Latin America, East Asia, Africa, and the Middle East. Ethnic study courses are offered in Afro-American and Indian history.

The History major provides strong preparation for elementary and secondary teaching and for employment in government, politics and business, for law school and for graduate study.

CURRICULUM IN HISTORY

Freshman	F	W	S
HIST 101, HIST 102, HIST 103 History of Western Civilization ..	3	3	3
HIST 221 Historical Craft .....	3		
HIST 222 Writing and Research Seminar in History.....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....		2	
CSC 110 Computers and Computing (F.1.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ENGL 215 Writing: Argumentation (A.4.) .....			4
POLS 204 Basic Political Thought .....	3		
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
<sup>1</sup> Physical or life sciences electives (B.1.) .....		3	3
	16	14	16



**Sophomore**

	<b>F</b>	<b>W</b>	<b>S</b>
HIST 201, HIST 202, HIST 203 United States History (D.1.) ....	3	3	3
ANT 201 Cultural Anthropology (D.4.a.) .....			3
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....	3		
GEOG 150 Human Geography .....		3	
POLS 105 Introduction to International Relations .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
SOC 105 Introduction to Sociology .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....		3	
<sup>1</sup> Mathematics or statistics elective (B.2.) .....			3
<sup>1</sup> Physical or life sciences elective (B.1.) .....	3		
<sup>2</sup> Electives .....	2	3	3
	17	15	15

**Junior**

HIST 301 Historiography .....	3		
HIST 315 Modern World History (D.2.) .....			3
U.S. History electives (300-400 level) .....	3	6	3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....	3	3	
<sup>1</sup> Physical or life sciences elective (B.1.) or Mathematics or statistics elective (B.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
<sup>1</sup> Technology elective (F.2.) .....		3	
<sup>1</sup> Mathematics elective (B.2.) .....			3
<sup>2</sup> Elective .....			3
	15	15	15

**Senior**

HIST 460 Senior Project .....	2		
European History electives (300-400 level) .....		3	3
History electives (300-400 level) .....	6		6
POLS 370 Contemporary Global Political Issues .....		3	
ANT/ECON/GEOG/POLS/SOCS/(300-400) electives .....		3	3
<sup>2</sup> Electives .....	7	9	3
	15	18	15

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in History and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> At least 13 units must be at the 300-400 level. Two years of foreign language are highly recommended. See adviser or department office for approved list.

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## JOURNALISM DEPARTMENT

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### Faculty

**Department Head, Randall L. Murray**

Nishan R. Havandjian

James H. Hayes

### Programs

B.S. Journalism with Concentrations in:

Agricultural Journalism

Broadcast Journalism

News-Editorial

Public Relations

The Journalism Department offers a professional program leading to the Bachelor of Science degree in Journalism. All journalism majors must complete the basic journalism curriculum, which includes courses in the journalism core and supplementary courses in the humanities, natural sciences, and social sciences. Each major must also complete a specified number of required and elective courses in one of the following concentrations: Agricultural Journalism, Broadcast Journalism, News-Editorial, or Public Relations.

No more than 56 credits of the 198 applied toward the degree may be in journalism and related professional courses. Basic B/W Photography (ART 221) and certain other offerings in art and graphic communication may be included. Students must consult advisers. Transfer students may apply a maximum of 12 journalism and professionally related quarter units (includes photography and graphics courses) to the major. All such units must be lower division offerings. Students transferring into the program are advised to limit these units to equivalents for JOUR 118, JOUR 201, JOUR 203, or ART 221.

All journalism majors are expected to serve as staff members of departmental communications media, including *Mustang Daily*, the student newspaper, or KCPR, the FM-stereo radio station. They are also expected to participate in professional and scholarly organizations in their interests. The department sponsors campus chapters of the Society of Professional Journalists, Sigma Delta Chi; the Public Relations Student Society of America; and the Agricultural Communicators of Tomorrow.

### CURRICULAR CONCENTRATIONS

#### Agricultural Journalism

Prepares for farm or farm-city careers in reporting and editing, radio and television news; public relations and publicity; advertising copywriting, and layout. Twenty-nine of the elective units must be chosen with the approval of the adviser.

#### Broadcast Journalism

Prepares students for careers as reporters and newscasters for radio and television. Emphasizes the acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in the news and public affairs aspects of the electronic media.

#### News-Editorial

Prepares students for reporting and editing jobs on the staffs of newspapers and wire services. Emphasizes acquisition of knowledge and skills necessary for initial employment upon graduation as well as those necessary for future growth to positions of responsibility in print media.

#### Public Relations

Prepares students for business, governmental, and institutional positions in public relations. Emphasizes the acquisition of knowledge and skills needed for future growth into management positions with the communications media and other institutions.

**CURRICULUM IN JOURNALISM****Freshman <sup>1</sup>**

	<b>F</b>	<b>W</b>	<b>S</b>
JOUR 118 Mass Media in Society .....	3		
JOUR 203 Reporting I .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
BUS 101 The Business Enterprise .....			4
CSC 110 Computers and Computing (F.1.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MGT 118 Introduction to Human Relations in Business .....			3
<sup>2</sup> Critical reading elective (C.1.) .....		3	
<sup>2</sup> Mathematics or statistics elective (B.2.) .....		3	
<sup>2</sup> Physical or life sciences electives (one each, one with lab) (B.1.) .....			3
<sup>3</sup> Electives and courses to complete major .....	3 4	3 4	
	17	16	16

**Sophomore**

JOUR 201 Journalism History .....	3		
JOUR 304 Reporting II .....		3	
JOUR 333 Broadcast News I .....			3
ART 221 Basic B/W Photography .....		3	
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2-4		
ECON 201/ECON 211/ECON 222 (D.3.) .....	3		
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
POLS 210 American and California Government (D.1.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
<sup>2</sup> Critical reading elective (C.1.) .....			3
<sup>2</sup> Mathematics or statistics elective (B.2.) .....	3		
<sup>3</sup> Electives and courses to complete major .....	4-6 17	1 17	3 18

**Junior**

JOUR 302 Law for Journalists .....			3
JOUR 312 Introduction to Public Relations .....	3		
AG 301 Agriculture and America (F.2.) .....		3	
ENGR 301 Technology in the 20th Century .....		3	
GEOG 315 Geography of Resource Utilization .....	3		
HIST 315 Modern World History (D.2.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
POLS 331 Political Parties and Interest Groups or POLS 332 Public Opinion and Political Participation .....			3
SOC 313 Urban Sociology .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
<sup>2</sup> Physical or life sciences elective (B.1.) .....		3	
Foreign language requirement .....	5	5	5
<sup>3</sup> Electives and courses to complete major .....		4	
	17	18	17

Senior	F	W	S
JOUR 405 Reporting III .....		3	
JOUR 444 Media Internship .....	4		
JOUR 460 Senior Project .....	3		
POLS 403 Municipal Government or POLS 401 State and Local Government .....	3		
<sup>2</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		3	3
<sup>3</sup> Electives and courses to complete major .....	4	10	12
	14	16	15

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Journalism and other subjects.

<sup>1</sup> Unless already acceptable typists, majors will be required to attain typing proficiency during their freshman year.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>3</sup> 19 to 29 of the elective units must be taken in a field of concentration. Three concentrations also require the election of one course from among the following: JOUR 205, JOUR 401, JOUR 407, JOUR 425.



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# MUSIC DEPARTMENT

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## Faculty

### Department Head, Clifton E. Swanson

Thomas H. Davies  
William V. Johnson

Ronald V. Ratcliffe  
Craig H. Russell

John G. Russell  
Graydon J. Williams

## Programs

Minor: Music

Through its courses and activities, the Music Department provides opportunities for personal enrichment to students from all other departments of the university. It offers students with an interest in music a broader insight into the general field of music through courses in appreciation, theory, harmony, and music history; it gives musically inclined students the opportunity to participate in university musical organizations and to further their proficiency both in singing and in playing instruments; and it provides the prospective teacher with basic skills and instructional techniques in music required for the elementary credential. The music program works cooperatively with various areas on campus to enable students to gain experience in fields such as recording technology, electronic music, acoustics, and music criticism.

The Music Department also serves as a cultural center for both Cal Poly and community through a program of public performances by student and faculty groups and through department-sponsored concerts, clinics, workshops, and lectures by outstanding individuals from outside the university.

## MUSIC MINOR

A 28-unit minor is available to students who desire documented competency in music. An individualized curriculum based on the following guidelines will be developed in consultation with a member of the music faculty. Information and application forms for the declaration of a Music minor are available in the Music Department.

	<i>Units</i>
Lower Division Core.....	13
MU 101 Materials of Music—Theory I (3)	
MU 203 Theory II (3)	
MU 102 Sight-Singing and Ear-Training (1) or	
MU 103 Rhythm Skills (1)	
MU 204 Appreciation of Music (3)	
One year of vocal or instrumental study (3)	
Upper Division Electives .....	15
Chosen from 300-400 level Music courses (or, in some cases, specific courses	
offered by other departments).	

28

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Music and other subjects.

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# PHILOSOPHY DEPARTMENT

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## Faculty

**Department Head (Interim), Talmage E. Scriven**

Stephen W. Ball	Laurence D. Houlgate	Frederick J. O'Toole
A. C. W. Bethel	Russell A. Lascola	Judy D. Saltzman
Stanislaus J. Dundon	Diane P. Michelfelder	Kendrick W. Walker
Charles T. Hagen		

## Programs

**Minor: Philosophy**

The courses offered by the Philosophy Department are intended to provide an opportunity for students to examine fundamental questions about the human condition, and the importance of those questions to historical, scientific, religious, and social issues. These courses will acquaint the student with the problems of logic (the nature of argument), metaphysics (the nature of reality), epistemology (the nature and limits of human knowledge), and axiology (the nature of what is right or worthwhile), and with the historical development of these problems and proposed solutions to them. The Philosophy Department also offers courses examining patterns of belief and worship in the world's major religions. All these courses provide the student with an opportunity to participate in philosophical discussion and to develop proficiency in critically examining philosophical positions, with a view to enabling the student to develop a personal philosophy and a more comprehensive view of the world.

## PHILOSOPHY MINOR

Students may earn a minor in Philosophy by a coordinated course of study consisting of 24 units (12 specified, 12 chosen from an approved list) designed by the individual student and the Philosophy Department. Interested students are invited to contact the Philosophy Department.

*Units*

Required courses.....	12
ENGL/PHIL/SPC 125 Critical Thinking (3)	
PHIL 230 Philosophical Classics (3)	
PHIL 231 Philosophical Classics (3)	
PHIL 311 History of Greek Philosophy (3)	
Electives to be chosen from the following groups: .....	12
<i>One of the following:</i>	
PHIL 312 History of Medieval Philosophy (3)	
PHIL 313 Continental Philosophy: Montaigne to Leibnitz (3)	
PHIL 314 British Philosophy: Bacon to Mill (3)	
PHIL 315 German Philosophy: Kant to Nietzsche (3)	
<i>One of the following:</i>	
PHIL 316 Contemporary European Philosophy (3)	
PHIL 317 Contemporary British and American Philosophy (3)	
<i>Two additional upper division philosophy courses excluding:</i>	
PHIL 305, PHIL 306 and PHIL 308.	

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Philosophy and other subjects.

## POLITICAL SCIENCE DEPARTMENT

### Faculty

#### Department Head, John H. Culver

William M. Alexander  
Gaye G. Benson  
Randal L. Cruikshanks  
David L. George

Reginald H. Gooden, Jr.  
Earl D. Huff  
Richard B. Kranzdorf  
Dianne N. Long

Carl E. Lutrin  
Carroll R. McKibbin  
Allen K. Settle  
Joseph N. Weatherby

### Programs

B.A. Political Science  
with Concentrations in:  
International Affairs  
Pre-Law

Public Administration  
Teaching  
Urban Studies  
Minor: Public Administration

The Political Science Department offers undergraduate instruction leading to the degree of Bachelor of Arts in Political Science. With a concern for theoretical principles as well as practical application, the degree requirements include both a common body of material and the completion of a curricular concentration in Political Science as listed below. Such curricular alternatives focus the training within the degree program toward career opportunities in government and other public agencies, private enterprise, and in the legal profession.

In addition to the major in Political Science, the department offers a minor in Public Administration. Beyond that, the Political Science Department provides students in all curricula within the university with an understanding of the operations of local, state, and national government and the processes by which the individual and community interact in the several levels of government. The department supports internship opportunities in local, state, and federal agencies in addition to applied public policy research opportunities through the Center for Practical Politics.

Through the required and elective courses, the department seeks to expand each student's comprehension of the political process, to develop those skills and attitudes which are essential for effective citizenship, and to prepare each Cal Poly graduate for intelligent and responsible political behavior.

### CURRICULAR CONCENTRATIONS

#### International Affairs

This concentration is designed to prepare students for careers in government and related agencies which deal in the many problems in international affairs and to prepare students to enter graduate studies in the field of international relations.

#### Pre-Law

This concentration is designed to prepare students for careers in the several fields of law. Some students who complete this concentration may seek admission to accredited law schools to continue their preparation for the law profession. Others may seek careers in law-related professions such as law enforcement, judicial administration and legal assistance.

#### Public Administration

This concentration is designed to prepare students for careers in administrative work in government and related agencies and to prepare students to enter graduate studies in the field of administration.

#### Teaching

This concentration is designed to prepare students for careers as elementary school teachers and for careers as social studies teachers in junior high schools and high schools.

Urban Studies

This concentration is designed to prepare students for careers in broad fields of planning within government and related agencies and to prepare students to enter advanced studies in the field of city and regional planning.

Individualized Course of Study

This program is designed to provide career identity for students who do not select any of the above concentrations and to permit students with varying backgrounds and interests to pursue a course of study which meets their individual needs and interests. It consists of 27 units of course work at the 300–400 level selected by the student and recommended by the student’s academic adviser.

OTHER CONCENTRATIONS AVAILABLE

Concentrations in Criminal Justice, Cross-Cultural Studies, and Social Services are currently offered by the Social Sciences Department and may be taken by Political Science majors. In addition, the following concentrations from the School of Business may be taken: Accounting, Human Resources Management, International Business Management, Management, and Management Information Systems.

CURRICULUM IN POLITICAL SCIENCE

Freshman	F	W	S
ENGL 114 Writing: Exposition (A.1.).....	4		
ENGL 215 Writing: Argumentation (A.4.) .....			4
POLS 100 Introduction to Political Science .....	3		
POLS 210 American and California Government (D.1.) .....	3		
POLS 102 California Government .....		3	
POLS 105 Introduction to International Relations .....			3
<sup>1</sup> ART/MU/TH elective (from approved department list) (C.2.) ....	3		
HIST 102, HIST 103 History of Western Civilization .....		3	3
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PE 250 Health Education (E.2.) .....			2
<sup>2</sup> Electives and courses to complete concentration .....	2	2	3
	15	14	15
Sophomore			
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
ECON 201/ECON 211/ECON 222 (D.3.) .....			3
<sup>1</sup> Technology elective (F.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
POLS 212 Comparative Politics.....	3		
<sup>1</sup> Mathematics elective (B.2.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
POLS 206 Judicial Process .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
<sup>1</sup> Computer literacy elective (F.1.) .....		3	
<sup>1</sup> Physical and life sciences electives (one each, one with lab) (B.1.) .....	3	6	3
<sup>2</sup> Electives and courses to complete concentration .....	2	2	2
	14	17	17



<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
POLS 305 Political Analysis .....		5	
POLS 314 Public Administration .....	3		
POLS 204 Basic Concepts of Political Thought .....	3		
Political Science electives (300-400 level) .....		3	3
HIST 315 Modern World History (D.2.) .....	3		
GEOG 308 Global Geography .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/SOC elective (D.4.b.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>1</sup> Critical reading electives (C.1.) .....		3	3
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....			6
<sup>2</sup> Electives and courses to complete concentration .....	2		3
	14	17	15
<b>Senior</b>			
POLS 461, POLS 462 Senior Project .....	2	2	
POLS 325 Public Policy Analysis .....	3		
Political Science electives (300-400 level) .....	6	9	6
<sup>2</sup> Electives and courses to complete concentration .....	6	6	8
	17	17	14

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> 7 units must be prefix other than POLS. 27 elective units at the 300-400 level must be chosen with the approval of the adviser in the field of concentration. Concentration lists available at the department office.

## PUBLIC ADMINISTRATION MINOR

Students interested in public sector careers may now enroll in the minor program in Public Administration. The minor consists of 27 units of course work and involves a supervised internship experience in a governmental agency. Details are available from the Political Science Department.

*Units*

Required courses: .....	19
POLS 314 Public Administration (3)	
POLS 318 Administration Theory and Behavior (3)	
POLS 319 Public Personnel Administration (3)	
POLS 325 Public Policy Analysis (3)	
POLS 340 Government Internship (4)	
POLS 405 Politics of Finance and Planning (3)	
Electives: .....	9
9 units of adviser approved electives.	
	28

See COURSES OF INSTRUCTION section of this catalog for description of courses in Political Science and other subjects.

## SOCIAL SCIENCES DEPARTMENT

### Faculty

**Department Head, James W. Coleman**

Barbara E. Cook  
Warren W. DeLey  
Donald R. Floyd  
Robert L. Hoover

Harold R. Kerbo  
Patrick C. McKim  
John A. McKinstry  
Leo W. Pinard II

William L. Preston  
Richard A. Shaffer  
George J. Suchand  
Calvin H. Wilvert

### Programs

**B.S. Social Sciences with Concentrations in:**

Criminal Justice  
Cross-Cultural Studies  
Organizations

Social Sciences (Teaching)  
Social Services

The Social Sciences Department provides a broadly based orientation to the study of society and its environment drawing on courses in anthropology, geography, and sociology. Students prepare for a wide range of careers in federal, state and local government; teaching; social services agencies; and criminal justice including probation, parole, law and law enforcement; as well as in business and industry. The flexible curriculum offers the student the opportunity for familiarization and analysis concerning the most sensitive and critical issues of the student's life.

The Social Sciences Department serves all of the schools of the campus in providing general education for citizenship. In general, the department seeks to provide the student with a better understanding of the society in which we live, to develop in the student those skills and attitudes which are prerequisites for effective citizenship, and to prepare and encourage the individual toward intelligent and responsible social action.

The occupational objectives of the department are to train students for those numerous entry jobs in civil service, business, industry, and social welfare which require a bachelor's degree with a major in the social sciences, and to train those who expect to teach social studies in elementary or secondary schools.

Students with majors in fields other than the social sciences may select courses which will aid in qualifying them for a variety of civil service positions.

The department offers the degree of Bachelor of Science in Social Sciences. This degree allows the student to choose among five concentrations leading to different careers.

### CURRICULAR CONCENTRATIONS

#### **Criminal Justice**

This concentration is designed to prepare students for careers in law, law enforcement, corrections, detention, probation, parole and other criminal justice agencies.

#### **Cross-Cultural Studies**

This concentration will prepare students for careers in a wide range of cross-cultural contexts: international development agencies, the public health field, intercultural education, plus numerous careers overseas in private industries.

### Organizations

This concentration provides a course of study that applies the general principles of human social behavior developed in the social sciences to the understanding of modern organizations. Students will explore such topics as the origins and functions of modern organizations, the social psychological dynamics of organizational behavior, and specific strategies for effective behavior in the organizational context.

### Social Sciences (Teaching)

With proper selection of electives, this concentration leads to preparation for elementary or secondary teaching on completion of the fifth year. It also provides the student with a broad background for entry positions in business.

### Social Services

This concentration provides a course of study that applies the general principles of human social behavior developed in the social sciences and specialized professional courses to train students for careers in the helping professions such as social work and counseling.

## OTHER CONCENTRATIONS AVAILABLE

Concentrations outside the Social Sciences Department also are offered as follows: Public Administration, Pre-Law, International Affairs or Urban Studies (Political Science Department), Human Resources Management, Management, or International Business Management (School of Business).

## CURRICULUM IN SOCIAL SCIENCES

Freshman	F	W	S
ENGL 114 Writing: Exposition (A.1.) .....	4		
SOC 105 Introduction to Sociology (D.4.a.) .....	3		
SOC 106 Social Problems .....		3	
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
GEOG 150 Human Geography .....	3		
ANT 201 Cultural Anthropology .....		3	
ANT 203 Physical Anthropology .....			3
<sup>1</sup> Physical or life sciences electives (one with lab) (B.1.) .....	3	3	6
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
GEOG 250 Physical Geography .....			3
LIB 101 Library Instruction .....	1		
<sup>2</sup> Electives and courses to complete major .....		3	2
	17	15	17
Sophomore			
<sup>1</sup> Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
POLS 105 International Relations .....	3		
STAT 211 Elementary Probability and Statistics (B.2.) .....	3		
SOC 323 Social Stratification .....		3	
ANT 202 World Prehistory .....			3
GEOG 215 Human Impact on the Earth .....	3		
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>1</sup> Mathematics elective (B.2.) .....	3		
<sup>1</sup> Computer literacy elective (F.1.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>2</sup> Electives and courses to complete major .....	2	2	
	17	17	16

## 272 Social Sciences

	F	W	S
<b>Junior</b>			
SOC 333, SOC 334 Social Research Methods I and II.....		3	3
HIST 315 Modern World History (D.2.).....	3		
Political Science elective (300-400 level) .....	3		
History elective (300-400 level) .....		3	
Geography 300-400 level courses .....			3
Anthropology elective (300-400 level).....		3	
Sociology elective (300-400 level) .....			3
<sup>1</sup> Technology elective (F.2.) .....			3
<sup>1</sup> Economics elective (D.3.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
BIO 220/HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>2</sup> Electives and courses to complete major .....	6	5	2
	14	17	17
<b>Senior</b>			
SOCS 461, SOCS 462 Senior Project .....	2	2	
SOCS 463 Undergraduate Seminar .....			3
Anthropology electives (300-400 level) .....	3	3	
Sociology electives (300-400 level) .....		3	3
SOC 421 Social Theory .....		3	
History elective (300-400 level) .....	3		
Geography electives (300-400 level) .....	3		3
<sup>1</sup> BUS/ECON/POLS elective (D.4.b.) .....			3
<sup>2</sup> Electives and courses to complete major .....	6	6	5
	17	17	17

See COURSES OF INSTRUCTION sections of this catalog for descriptions of courses in Anthropology, Geography, Social Sciences, Sociology and other subjects.

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> 27 of the elective units must be chosen with the approval of the adviser in a field of concentration.

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## SPEECH COMMUNICATION DEPARTMENT

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### Faculty

#### Department Head, Harry Sharp, Jr.

James R. Conway  
James R. Emmel  
Michael L. Fahs

David Henry  
Pamela Cook Miller  
Keith E. Nielsen

Terrence C. Winebrenner  
Raymond F. Zeuschner

### Programs

B.A. Speech Communication

Minor: Speech Communication

The Speech Communication Department serves the entire university. Its offerings enable students to fulfill requirements in general education, prepare for communication-centered careers, and enhance both cultural awareness and individual potentials.

The objectives of the department are to teach the composite knowledge and skills of the communication arts and sciences, both for students preparing for communication-oriented careers and for prospective teachers in the public schools.

The Speech Communication Department offers a Bachelor of Arts degree, a minor and a teacher certification program. Students complete a basic core curriculum and consult with their advisers to choose a program of appropriate support courses in one of the following emphasis areas: Organizational Communication, Persuasion and Sales, Pre-Law, Public Relations, and International Communication. Students pursuing the Speech Communication minor must complete the program listed below. Through the Theatre and Dance Department, specializations are available in Technical Theatre, Theatre Management and Theatre Performance; a Theatre minor is also available. Please consult with the appropriate advisers for details. The total program of the Speech Communication Department is geared not only toward a broad theoretical knowledge of the discipline but also toward providing many opportunities for participation in a variety of communication-related activities.

Cocurricular activities are available for students interested in the speech arts. Intercollegiate forensic tournaments provide opportunities for Cal Poly speakers to compete with students from other universities and colleges in debate and other speech events. Additional student activities include public speaking, oral interpretation, and interpreters theatre presentations to campus and community audiences.

**CURRICULUM IN SPEECH COMMUNICATION**

**Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
SPC 101 Professional Fields of Speech .....	1		
SPC 201 Public Speaking (A.3.) .....			3
SPC 203 Voice and Articulation .....	3		
SPC 250 Forensic Activity .....		1	
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
HE 210/PE 250/PSY 304 elective (E.2.) .....	2		
HIST 101, HIST 102, HIST 103 History of Western Civilization ..	3	3	3
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
<sup>1</sup> Physical or life sciences elective (one with lab) (B.1.) .....		3	
<sup>1</sup> Mathematics or statistics elective (B.2.) .....		3	
<sup>1</sup> Mathematics, physical or life sciences elective (B.1. or B.2.) .....	3		
<sup>1</sup> Computer literacy elective (F.1.) .....			3
Electives .....		3	3
	<u>16</u>	<u>16</u>	<u>15</u>

**Sophomore**

SPC 212 Interpersonal Communication .....	3		
SPC 213 Organizational Communication .....			4
SPC 217 Small Group Communication .....		4	
SPC 350 Advanced Forensic Activity .....		2	
ENGL 215 Writing: Argumentation (A.4.) .....	4		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
PSY 202 General Psychology (E.1.) .....			3
TH 210 Introduction to Theatre (C.2.) .....	3		
<sup>1</sup> Critical reading electives (C.1.) .....	3		3
<sup>1</sup> Life sciences elective (B.1.b.) .....		3	
<sup>1</sup> Physical sciences elective (B.1.a.) .....			3
Electives .....	3	3	2
	<u>16</u>	<u>15</u>	<u>15</u>

**Junior**

SPC 305 Oral Interpretation .....		4	
SPC 312 Communication Theory .....		4	
SPC 320 Nonverbal Communication .....			3
SPC 322 Persuasion .....			4
SPC 330 Classical Rhetorical Theory .....	4		
SPC 460 Undergraduate Seminar .....			1
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
<sup>2</sup> ENGL 302 Writing: Advanced Composition .....	4		
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
HIST 315 Modern World History (D.2.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
<sup>1</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		3	3
<sup>3</sup> Support courses .....	3		4
	<u>17</u>	<u>17</u>	<u>15</u>

Senior	F	W	S
SPC 411 Communication Research .....	4		
SPC 430 Rhetorical Criticism .....		4	
SPC 461 Senior Project .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
<sup>1</sup> Economics elective (D.3.) .....	3		
<sup>1</sup> Technology elective (F.2.) .....			3
Theatre or Speech Communication electives (300-400 level) .....	4	3	4
<sup>3</sup> Support courses .....		4	3
Electives .....	3		3
	17	14	13

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements (at least 6 units must be at 300-400 level). (Please see page 98 of this catalog.)

<sup>2</sup> Or score of 10 on Junior Writing Test.

<sup>3</sup> 14 units from courses chosen with approval of student's adviser; minimum of 7 units at 300-400 level.

## CURRICULUM FOR SPEECH COMMUNICATION MINOR

A 24-unit minor is available for students who desire documented competency in Speech Communication. After completing the core courses listed below, students may select the remainder of their courses from an approved list. Copies of the list and further information and application forms are available in the Speech Communication Department office.

Units

Required courses.....	14
SPC 201 Public Speaking or	
SPC 202 Principles of Speech (3)	
SPC 212 Interpersonal Communication (3)	
SPC 312 Communication Theory (4)	
SPC 330 Classical Rhetorical Theory or	
SPC 331 Contemporary Rhetorical Theory (4)	
Electives .....	10
10 units of Speech Communication of which at least 8 units must be 300-400 level.	
	24

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Speech Communication and other subjects.

# THEATRE AND DANCE DEPARTMENT

## Faculty

Department Head, Roger Kenvin

Peter Kentes  
Michael Malkin

Moon Ja Minn Suhr  
Russell Whaley

## Programs

Minor: Dance

Minor: Theatre

The courses offered by the Theatre and Dance Department provide students with a well-balanced program of studies, useful as a solid base on which to build further graduate or professional studies, as an attractive supplement to their other studies, or as a way of stretching themselves creatively. Courses are offered in both the theory and practice of theatre and dance. A full range of studio dance courses is available, plus courses designed especially for future teachers of dance. In theatre, the major aspects of the discipline are covered—technical theatre, design, acting and directing. General Education and Breadth courses are available for the inquiring student in Introduction to the Theatre and for the more advanced student in Theatre History and Literature.

The department also acts as a campus and community cultural focus with its production of three mainstage dramatic productions and its annual Orchestis dance concert. All Cal Poly students have the opportunity to participate in these productions through auditioning, volunteering, or course work. Recent stage productions have included *Macbeth*, a new musical *Histrioniks*, *The Importance of Being Earnest*, *Crimes of the Heart*, and *Guys and Dolls*. In addition, the department frequently sponsors special guest lecturers and student-directed productions. Minors are offered in both Dance and Theatre.

## DANCE MINOR

The Dance Minor consists of 30 units centering around a group of core courses and also permitting emphasis in either Choreography/Performance or Dance Education.

Admission to the minor is contingent upon a departmental interview and review. In addition, for the Choreography/Performance emphasis area, admission is contingent upon an audition. All students must have more than a 2.0 GPA.

Units

Core courses:	18
DANC 111 Fundamentals of Movement (1)	
DANC 131 Beginning Ballet (1)	
DANC 140 Improvisation (1)	
DANC 211 Orientation to Dance (3)	
DANC 320 Dance Notation (3)	
DANC 321 History of Dance (3)	
DANC 340 Dance Composition (3)	
MU 101 Materials for Music Theory I (3)	



Choose one of the following areas of emphasis: ..... 12

*Choreography/Performance:*

- DANC 231 Intermediate Ballet (2)
- DANC 232 Intermediate Modern Dance (2)
- DANC 233 Intermediate Jazz (2)
- DANC 345 Choreography (3)
- DANC 346 Stage Dance Production (3)

*Dance Education:*

- Select one of the following courses: (3)
- DANC 135 Folk Dance
- DANC 232 Intermediate Modern Dance
- DANC 233 Intermediate Jazz
- DANC 234 Intermediate Social Dance
- DANC 381 Recreational Dance Theory (3)
- DANC 382 Creative Dance for Children (3)
- DANC 383 Contemporary Dance Styles (3)

30

## THEATRE MINOR

The Theatre Minor requires 28 units designed to provide the student with a sound foundation in the major aspects of theatre.

Admission to the minor is contingent upon a departmental interview and review. In addition, all students must have more than a 2.0 GPA.

This program assures each student of a balanced program in the major areas of theatre and it also allows for a degree of specialization in an area of the student's choice. Students should discuss their interests with department faculty.

*Units*

Core courses ..... 18-21

- TH 210 Introduction to the Theatre (GEB C.2.) (3)
- TH 327 Theatre History and Literature (GEB C.3.) (3)
- TH 328 Theatre History and Literature (GEB C.3.) (3)
- TH 330 Stagecraft (3-6)
- TH 340 Acting (3)
- TH 430 Introduction to Stage Design: Scenery (3)

Elective courses to be selected from the following ..... 7-10

- TH 342 Directing (3)
- TH 345 Rehearsal and Performance (2)
- TH 380 Children's Drama (3)
- TH 432 Introduction to Stage Design: Costume (3)
- TH 434 Introduction to Stage Design: Lighting and Sound (3)
- TH 450 Theatre Management (3)
- TH 470 Selected Advanced Topics (1-3)

28



# School of Professional Studies and Education

## DEGREE PROGRAMS

B.S. Child and Family Development.....	321
Applied Developmental Psychology Option	
Early Childhood Education Option	
Family Studies Option	
B.S. Graphic Communication .....	296
Computer Graphic Communication Option	
Design Reproduction Technology Option	
Printing Management Option	
Printing Technology Option	
B.S. Home Economics .....	300
B.S. Industrial Technology .....	304
Industrial Education Option	
Industrial Management Option	
B.A. Liberal Studies.....	308
B.S. Physical Education .....	313
Commercial/Corporate Fitness Option	
Health Education Option	
Teaching Option	
B.S. Recreation Administration .....	317
Private/Commercial Recreation Concentration	
Therapeutic Recreation Concentration	
M.S. Counseling.....	291
M.A. Education .....	283
Administrative Services Specialization	
Computer Based Education Specialization	
Counseling and Guidance Specialization	
Curriculum and Instruction Specialization	
Reading Specialization	
Special Education Specialization	
Special Interest Option	
M.S. Home Economics.....	300
M.A. Industrial and Technical Studies .....	306
M.S. Physical Education .....	319

## MINORS

Gerontology .....	281
Psychology .....	325

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## SCHOOL OF PROFESSIONAL STUDIES AND EDUCATION

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Harry J. Busselen, Dean

Dennis M. Nulman, Associate Dean

The School of Professional Studies and Education offers several major curricula leading to Bachelor of Science, Bachelor of Arts, Master of Arts, and Master of Science degrees. In addition, each department provides courses which are designed to serve all other departments of the university in offering experiences to students that enhance their general education.

The School of Professional Studies and Education is a unique school in that it is comprised of diverse disciplines with a common goal. This common goal is the preparation of students in career fields which are not oriented around a single discipline.

The seven departments in the school are: Education, Graphic Communication, Home Economics, Industrial Technology, Military Science, Physical Education and Recreation Administration, and Psychology and Human Development. Each offers its specialized studies taught by faculty with academic expertise and professional experience. Academic minors are offered in Gerontology and Psychology.

The unifying element within each department is the interdisciplinary studies that are taken by all students. Knowledge is gathered from many areas and consolidated into a specialized emphasis. Students who are interested in specialized careers pursue their goals under the guidance of faculty and staff who are themselves uniquely qualified and experts in the various areas of study.

The Bachelor of Arts in Liberal Studies is offered in connection with the teacher education program. The school, through the Education Department, assists in the coordination of a campus-wide teacher education program and in the preparation of individuals seeking teaching, counseling or administrative services, reading and special education specialist credentials.

The school has taken the leadership in the sponsorship or direction of numerous community oriented projects which are timed to meet social needs in cooperation with local, state and federal agencies.

The university supports a strong cocurricular program, and to this end the School of Professional Studies and Education provides valuable experiences to its students through specialized cocurricular activities which include: American Home Economics Association, American Institute of Plant Engineers, American Society of Interior Designers, Association of Fitness in Business, California Association of Health, Physical Education, Recreation and Dance, Cal Poly Teachers Society, Council for Exceptional Children, Epsilon Pi Tau (Industrial Technology), Friends of Shakespeare Press, Home Economics Advisory Board, Human Development Club, Industrial Technology Society, Mat Pica Pi (Graphic Communication), Military Science and Advisory Board, Phi Upsilon Omicron (Home Economics), Recondo Unit, Recreation Administration Majors Club, Scabbard and Blade, Society of Plastic Engineers, Style.

## GERONTOLOGY MINOR AND CERTIFICATE PROGRAM

### An Interdisciplinary Program

This is an interdisciplinary program to upgrade the skills and increase the knowledge of persons already in the field of gerontology and to train students in various majors whose careers will be directly or indirectly related to gerontology. In addition, the program trains interested persons in providing continuing education programs for senior adults and assure the availability and accessibility of these programs to the elderly population through continuing education and peer educators.

The students acquire knowledge in the areas of the biological aspects of aging, the impact of an aging population on institutions, (social, economic and political) and institutions affect upon the needs, familiarity with changing roles and alternative roles, special housing and clothing needs of the frail elderly, stress related problems and retirement and leisure activities. The focus of the curriculum will be on the majority of the elderly population (the independent, functioning older adult), while at the same time the program will recognize that a percentage of the elderly population have special needs due to mental and/or physical ailments.

Among the requirements for admission to the program is a minimum GPA of 3.00. All applicants will be reviewed by a faculty committee.

### Curriculum

	<i>Units</i>
Required Core .....	12
BIO 330 Biology of Aging (3)	
HD 308 Adulthood and Aging (3)	
PE 306 Exercise and Health Promotion for Senior Adults (3)	
SOC 326 Sociology of Aging (3)	
Required Electives (to be selected with adviser's approval) .....	6
DFA 315 Geriatric Nutrition (3)	
PSY 310 Death, Dying and Bereavement (3)	
REC 328 Aging and Leisure (3)	
Electives (to be selected with adviser's approval) .....	3
HE 207 Problems of Family Housing (3)	
HE 237 Clothing and the Individual (3)	
HE 423 Clothing for Disabled People (3)	
PSY 317 Psychology of Stress (3)	
PSY 459 Life Span Development (3)	
<sup>1</sup> Fieldwork .....	3
	24

<sup>1</sup> Fieldwork may be fulfilled through the field placement/cooperative education/internship in the student's major (if related to gerontology), or it may be challenged due to previous work experience the student has had in gerontology.

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## EDUCATION DEPARTMENT

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### Faculty

#### Department Head, Richard L. Warren

MaryLud Baldwin  
Donald Cheek  
John B. Connely  
Leonard Davidman  
Erland G. Dettloff  
Howard Drucker

Margaret J. Glaser  
Jack B. Jones  
Robert L. Levison  
Donald K. Maas  
Susan L. McBride  
Don M. Morris

Kenneth F. Palmer  
Louis D. Pippin  
Marilynn F. Rice  
David J. Sanchez  
Bernard A. Troy

### Programs

M.S. Counseling

M.A. Education

with Specializations in:

Administrative Services

Computer Based Education

Counseling and Guidance

Curriculum and Instruction

Reading

Special Education

Special Interest Option

The Education Department offers a wide variety of courses and programs leading to careers in education. Common to all programs is a commitment to excellence, to cooperation and collaboration, to preparation for future educational challenges. By the late 1980's a pronounced teaching shortage will be upon us. Enrollments in grades K-12 are already increasing and with them the need for teachers. New roles for highly competent teachers are developing, and teaching can lead to specialist positions—in administration, counseling, special education, reading, computer-based education. To meet the need for teachers the Education Department seeks talented, creative students who are committed to a long term career in education and to the improvement of educational processes and institutions.

The Education Department offers a broad range of Master's degree specializations and teaching credential programs for qualified candidates. Both a Master of Arts degree in Education and a Master of Science degree in Counseling are available. The Master of Arts degree in Education has areas of specialization in Administration, Computer Based Education, Counseling and Guidance, Curriculum and Instruction, Reading, Special Education and Special Interest Option. Credential programs include preliminary and advanced teaching credentials in single and multiple subjects. Service and specialist credentials in Administrative Services, Pupil Personnel Services, Reading Specialist and Special Education Specialist (Learning Handicapped, Severely Handicapped, and Resource Specialist) are also offered. To accommodate the working professional, courses are offered during the late afternoon and evening.

Stressing the "learn by doing" philosophy of education, the department provides opportunities for extensive student on-site observation and field work. Cal Poly maintains cooperative relations with the surrounding school districts, and within our service area students can enjoy cross-cultural, urban and rural field work. Additionally, the department operates two clinics as a service to the community and for training purposes. The Reading Clinic provides diagnostic and remedial services for clients of school age. The Counseling and Guidance Clinic provides services in family, marital, individual, and child counseling.

## MASTER OF ARTS DEGREE—EDUCATION

### General Characteristics

The Master of Arts degree in Education is designed to provide both a broad-based perspective of education and increased competence in positions of special responsibility. Education master's degree programs described in this section are closely related to the occupational and professional requirements of a variety of vocational pursuits in the fields of education, counseling, college student affairs, and agencies involved with community affairs.

### Program of Study

All programs require a minimum of 45 quarter units of acceptable graduate work, with at least 24 of the units with an Education prefix at the 500 series level. Courses taken in these programs may also be applied toward related credentials.

The candidate must maintain a grade point average of 3.0 (B) or better in all course work attempted subsequent to admission to postbaccalaureate standing. Calculation of the grade point average will include all grades, although only the courses with A, B, or C grades will be counted to satisfy requirements for the degree. Required courses with a D or F grade must be repeated in all M.A. programs. All candidates must meet the current Graduation Writing Requirement (See page 119).

Credits earned in student teaching will not be accepted toward completion of any specialization within the Master of Arts in Education. At least 36 program-required quarter units shall be completed in residence. Transfer and/or extension credits will only be accepted when the credits are acceptable for master's degree credit by the offering institution in its own programs.

Depending on the specialization, final assessment of a candidate's progress shall include either a comprehensive written examination, an oral examination, and/or the completion of a thesis/project. Although only six units of credit may be applied to the degree requirements, students must enroll in ED 599 Thesis/Project for every quarter in which they are receiving advisement.

### Conditionally Classified Standing

The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

### Classified Standing

For admission as a classified graduate student, a student shall have a minimum grade point average of 3.0 in the last 90 quarter units attempted. A student shall have earned an acceptable baccalaureate degree from a regionally accredited institution. Or, the student shall have completed equivalent academic preparation and have satisfactorily met the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as the appropriate university authorities may prescribe. Only those applicants who show promise of success and fitness will be admitted to the graduate degree program, and only those who continue to demonstrate a satisfactory level of scholastic competence and who possess appropriate personal qualities will be eligible to continue in such a program.

### Advancement to Candidacy

Advancement to master's degree candidacy requires completion of a minimum of 24 quarter units of program-required courses in residence, specified in a formal program of study, with a minimum grade point average of 3.0 and the formal recommendation of the specialization faculty. Students must maintain a minimum grade point average of 3.0 in all course work included on the formal program of study, and in all course work completed subsequent to admission to postbaccalaureate standing.

**MASTER OF ARTS DEGREE IN EDUCATION WITH A  
SPECIALIZATION IN ADMINISTRATIVE SERVICES**

This program is designed for career candidates in school administration. It emphasizes a comprehensive knowledge of public school administration including applied theory of administration and leadership, schools in contemporary society, and effective management related to educational outcomes. While designed for career school administrators, the program can be helpful for administrators in other fields. A comprehensive written examination is required at the end of the program.

Most work in this program is applicable to an Administrative Services Credential (See credential programs).

	<i>Units</i>
Education Core .....	12
ED 585 Research Methods in Education (3)	
ED 586 Group Processes in Education (3)	
ED 587 Educational Psychology (3)	
ED 588 Cultures, Communities, and Education (3)	
Required in the Area of Specialization.....	29
ED 501 Problems and Practices in Curriculum Development (3)	
ED 510 Educational Finance and Resource Allocation (3)	
ED 511 Educational Law and Governance (3)	
ED 512 Educational Organization and Management (3)	
ED 513 Educational Leadership and Decision Making (4)	
ED 514 School Site Administration (4)	
ED 515 Educational Program Management and Evaluation (3)	
ED 516 Educational Personnel Management and Evaluation (4)	
ED 517 Organizational Development in Education (2)	
Electives (to be selected with adviser's approval) .....	4
	45



## MASTER OF ARTS DEGREE IN EDUCATION WITH A SPECIALIZATION IN COMPUTER BASED EDUCATION

The Computer Based Education specialization is designed to prepare teachers and other school personnel to develop and use computer programs for classroom instruction. Graduates of this program are expected to be capable of producing their own courseware and software and of providing leadership in the modification of curricula to take advantage of available educational software. In addition to the forty-five units of formal program requirements, students must complete three additional courses: a course on programming in BASIC, a course on programming in Pascal, and a course on classroom management. Students will be admitted to the program without having taken these courses. However, if needed, they should be taken early in the program and they will not count for elective credit. A thesis/project is required for completion of the program. Courses taken in this program may be applied toward a fifth year of study for the clear credential.

### Prerequisites

Students entering the Computer Based Education Program are expected to bring with them a background in certain basic subject areas or to make up deficiencies in these basic subject areas after admission. These include the following Cal Poly courses or their equivalents:

#### *BASIC Programming*

- CSC 110 Computers and Computing or
- CSC 410 Computer Fundamental for Educators

#### *Pascal Programming*

- CSC 112 Pascal Programming or
- CSC 118 Fundamentals of Computer Science

#### *Classroom management*

- ED 409 Teaching in the Secondary School or
- ED 411 Organization and Management in the Elementary School

	<i>Units</i>
Education Core .....	18
ED 585 Research Methods in Education (3)	
ED 586 Group Processes in Education (3)	
ED 587 Educational Psychology (3)	
ED 588 Cultures, Communities, and Education (3)	
<sup>1</sup> ED 599 Thesis/Project (3) (3)	
Required Courses in Computer Science.....	15
CSC 411 Advanced Programming for Educators (3)	
CSC 413 Authoring Languages (3)	
CSC 414 Computer Assisted Instruction (3)	
CSC 416 Computer Applications in School Administration (3)	
CSC 427 Computer Based Educational Systems (3)	
Restricted Electives in Education (Two courses from this section must be completed) .....	6
ED 407 Teaching Language Arts in the Elementary School (3)	
ED 501 Problems and Practice in Curriculum Development (3) or	
ED 515 Educational Program Management and Evaluation (3)	
ED 506 Models of Instruction (3)	
ED 507 Instructional Materials (3)	
ED 528 Reading Programs (3)	
Restricted Electives on Computer Usage (Two courses from this section must be completed) .....	6
CSC 527 Advanced Computer Based Educational Systems (3)	
IT 423 Computer Hardware (3)	
ART 464 Graphics and Animation Techniques for Microcomputers (3)	

<sup>1</sup> Must register for thesis/project credit each quarter of advisement.

MASTER OF ARTS DEGREE IN EDUCATION WITH A  
SPECIALIZATION IN COUNSELING AND GUIDANCE <sup>1</sup>

The Master of Arts degree in Education—Counseling and Guidance Specialization, is designed to prepare students for careers in public or private school counseling or student affairs work in higher education. Admission to the program requires qualifying examinations, references, an autobiographical statement, and an interview. Pupil Personnel Services (PPS) Credential candidates must meet credential requirements of the State of California. Only six quarter units of fieldwork experience will apply toward the M.A., although additional fieldwork will be required to meet PPS credential and student affairs requirements. Student affairs candidates must include ED 562 and ED 563 in their formal program of study. A comprehensive exam is required during the final quarter of study. The student may substitute a thesis/project for the comprehensive examination. Courses taken in this program may be applied toward a fifth-year study for a clear teaching credential. Candidates whose goals are for clinical counseling careers in agency settings or in private practice should refer to the Master of Science in Counseling.

	<i>Units</i>
Education Core .....	12
ED 585 Research Methods in Education (3)	
ED 586 Group Processes in Education (3)	
ED 587 Educational Psychology (3)	
ED 588 Cultures, Communities, and Education (3)	
Required in the Area of Specialization.....	30
ED 555 Introduction to Counseling (3)	
ED 556 Minority Counseling (3)	
ED 557 Career/Community Resource Utilization (3)	
ED 560 Counseling Theories (3)	
ED 561 Group Guidance and Counseling (3)	
ED 564 Consultation, Ethics and the Law (3)	
ED 570 Non-Sexist and Relationship Counseling (3)	
ED 573 Field Experience—Counseling (6)	
ED 582 Investigative Techniques (3)	
Electives (to be selected with adviser's approval) .....	6
	<b>48</b>

<sup>1</sup> Prerequisites: Psychological Testing, Personality Theory, and Developmental Psychology.

## MASTER OF ARTS DEGREE IN EDUCATION WITH A SPECIALIZATION IN CURRICULUM AND INSTRUCTION

The Curriculum and Instruction Specialization aims at expanding the candidate's instructional skills and knowledge of curriculum. Candidates may want to improve their skills as classroom teachers; they may choose to enter positions as resource teachers, curriculum specialists, or instructional team leaders; or they may seek employment in the private sector in curriculum and training related positions. Courses taken in this program may be applied toward a fifth year of study for a clear teaching credential. In addition to the general prerequisites, applicants must have successfully completed student teaching prior to entering the program. At least 24 units of curriculum and instruction courses are required. All electives must be approved by the candidate's adviser.

Either a comprehensive examination or a thesis/project is required for the completion of a master's degree with a specialization in curriculum and instruction.

	<i>Units</i>
Education Core .....	12
ED 585 Research Methods in Education (3)	
ED 586 Group Processes in Education (3)	
ED 587 Educational Psychology (3)	
ED 588 Cultures, Communities, and Education (3)	
Required in the Area of Specialization.....	24
ED 501 Problems and Practices in Curriculum Development (3)	
ED 503 Seminar in Language Arts Curriculum and Methods (3)	
ED 504 Seminar in Science Curriculum and Methods (3)	
ED 505 Seminar in Social Studies Curriculum and Methods (3)	
ED 506 Models of Instruction (3)	
ED 507 Instructional Materials (3)	
<sup>1</sup> ED 599 Thesis/Project (3) (3) or	
ED electives approved by adviser (6)	
Electives (selected with adviser's approval) .....	9
Suggested Electives: ED 502, ED 515, ED 526, MATH 435, PE 332, CSC 410	

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 45

<sup>1</sup> Must register for thesis/project credit each quarter of advisement.

**MASTER OF ARTS DEGREE IN EDUCATION WITH A  
SPECIALIZATION IN READING**

The Master of Arts degree in Education with a specialization in Reading is designed to present the candidate an opportunity for advanced preparation in reading. Graduate students not meeting minimum standards may appeal for special consideration to the Reading Assessment Committee.

Either a comprehensive examination or a thesis/project is required for the completion of a master's degree with a specialization in reading.

	<i>Units</i>
Education Core .....	12
ED 585 Research Methods in Education (3)	
ED 586 Group Processes in Education (3)	
ED 587 Educational Psychology (3)	
ED 588 Cultures, Communities, and Education (3)	
Required in the Area of Specialization.....	27
ED 525 Reading Process (3)	
ED 526 Diagnosing Reading Problems (3)	
ED 527 Remediation of Reading Problems (3)	
ED 528 Reading Programs (3)	
ED 529 Teaching Reading to Bilingual Students (3)	
ED 530 Teaching Reading in the Secondary Schools (3)	
ED 533 College Adult Reading Practices (3)	
ED 534 Advanced Clinical Experience in Reading (3)	
ED 582 Investigative Techniques (3)	
Electives .....	6
Electives are to be selected with adviser's approval or	
<sup>1</sup> ED 599 Thesis/Project (3) (3)	

<sup>1</sup> Must register for thesis/project credit each quarter of advisement.

## MASTER OF ARTS DEGREE IN EDUCATION WITH A SPECIALIZATION IN SPECIAL EDUCATION

The Master of Arts degree with a specialization in Special Education is an academic program that offers the student an opportunity for advanced learning in Special Education. Applicants must meet personal and professional standards, including necessary qualifying examinations, presentation of personal recommendations, and a personal interview.

Units for the Master's degree program can be applied towards the requirements for a clear single or multiple subjects teaching credential. It is also possible for the qualified student to complete the requirements for the Specialist Credential while pursuing the requirements for the Master of Arts degree in Education.

A comprehensive written examination and a thesis/project are required for the completion of the Master's degree with a specialization in Special Education.

	<i>Units</i>
Education Core .....	12
ED 585 Research Methods in Education (3)	
ED 586 Group Processes in Education (3)	
ED 587 Educational Psychology (3)	
ED 588 Cultures, Communities, and Education (3)	
Required in the Area of Specialization.....	21
ED 540 Guidance Services for Exceptional Students (3)	
ED 548 Career Development of Exceptional Persons (3)	
ED 553 Current Issues in Special Education (3)	
ED 582 Investigative Techniques (3)	
<sup>1</sup> ED 599 Thesis/Project (3) (3)	
CSC 410 Computer Fundamentals for Educators (3)	
Electives (selected with adviser's approval) .....	12
	45

<sup>1</sup> Must register for thesis/project credit each quarter of advisement.

**MASTER OF ARTS DEGREE IN EDUCATION—  
SPECIAL INTEREST OPTION**

The Special Interest Option provides maximum flexibility to develop a master's degree program consistent with an individual's unique needs and interests. This program is designed for candidates whose career aspirations are not directly related to other Master of Arts programs available in the Education Department. In addition to the 12 unit education core, the candidate selects courses in education and/or other subject fields in order to design a unified, approved program of study.

*In consultation with the adviser, each candidate develops a study program based on the following specifications:*

	<i>Units</i>
Education Core .....	12
ED 585 Research Methods in Education (3)	
ED 586 Group Processes in Education (3)	
ED 587 Educational Psychology (3)	
ED 580 Cultures, Communities, and Education (3)	
Special Interest Specialization (to be selected with adviser's approval) .....	33
Special Interest Concentration (18)	
Electives (9)	
<sup>1</sup> ED 599 Thesis/Project (3) (3)	

<sup>1</sup> Must register for thesis/project credit each quarter of advisement.



## MASTER OF SCIENCE DEGREE IN COUNSELING

### General Characteristics

The Master of Science in Counseling, within the Education Department, provides graduate training in clinical counseling for candidates preparing for careers in agencies and/or seeking educational verification for the Marriage, Family and Child Counseling (MFCC) License. Admission to the program requires qualifying examinations, references, autobiographical information, an interview, and a minimum grade point average of 3.0.

### Program of Study

The Master of Science in Counseling is required for students selecting the clinical career areas of Marriage, Family and Child Counseling (MFCC) educational verification and/or clinical training in agency counseling.

The candidate must maintain a grade point average of 3.0 (B) or better in all courses taken subsequent to admission to baccalaureate standing. Calculation of the grade point average will include all grades, though only the units in courses with grades of A, B, or C will be counted to satisfy requirements for the degree. Required courses with a grade of D or F must be repeated. All candidates must meet the current Graduation Writing Requirement (see page 119).

Forty-five quarter units must be completed in residence. Transfer credits will be allowed if acceptable for master's degree credit at the offering institution and approved by the Counseling Coordination Committee.

Completion of a thesis or project is required for the Master of Science degree in Counseling. Each candidate must file a formal program of study by the end of the first quarter as a classified graduate student. The student must complete one quarter in residence before applying for formal admission into the MFCC educational verification program. Major emphasis is placed on the professional and personal growth of each graduate student; consequently, candidates will be encouraged to experience the counseling relationship as clients and as counselors.

### Prerequisites

Specific course prerequisites are abnormal psychology, physiological psychology and developmental psychology. Candidates who have not completed such courses will not be denied admission, but will be required to add courses in the areas of deficiency to their formal program of study.

### Classified Standing

For admission as a classified graduate student, a student shall have a minimum grade point average of 3.0 in the last 90 quarter units attempted, and shall have earned an acceptable baccalaureate degree from an institution accredited by a regional association. Additionally, the graduate student must have satisfactorily met the professional, personal, scholastic, and other standards for graduate study, including qualifying examinations, as the appropriate university authorities may prescribe. Only those applicants who show promise of success and fitness will be admitted, and only those who continue to demonstrate a satisfactory level of scholastic competence and who possess appropriate personal qualities will be eligible to continue in such a curriculum.

### Conditionally Classified Standing

The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

### Advancement to Candidacy

Advancement to master's degree candidacy requires completion of a minimum of 30 quarter units of required courses in residence, specified in a formal program of study, with a minimum grade point average of 3.0 and the formal recommendation of the specialization faculty. Students must maintain a minimum grade point average of 3.0 in all course work completed subsequent to admission to the program.

CURRICULUM FOR THE MASTER OF SCIENCE DEGREE IN COUNSELING

	Units
Required Courses .....	6
<i>Child Development</i>	
HD 450 Family Therapy (3)	
<i>Computer Science</i>	
CSC 410 Computer Fundamentals for Educators (3) or any other CSC course approved by adviser which meets the student's career needs.	
Education .....	60
ED 555 Introduction to Counseling (3)	
ED 556 Minority Counseling (3)	
ED 557 Career/Community Resource Utilization (3)	
ED 560 Counseling Theories (3)	
ED 561 Group Guidance and Counseling (3)	
ED 564 Consultation, Ethics and Law (3)	
ED 565 Diagnosis and Treatment Planning (3)	
ED 566 Advanced Group Counseling (3)	
ED 567 Counseling the Elderly (3)	
ED 568 Cognitive Behavioral Counseling (3)	
ED 569 Practicum in Counseling (3) (3)	
ED 570 Non-sexist and Relationship Counseling (3)	
<sup>1</sup> ED 573 Field Experience-Counseling (12)	
ED 582 Investigative Techniques (3)	
ED 585 Research Methods in Education (3)	
<sup>2</sup> ED 599 Thesis/Project (3) (3)	
Psychology .....	9
PSY 432 Psychological Testing (3)	
PSY 454 Personality (3)	
PSY 455 Learning and Motivation (3) or Adviser approved PSY elective (3)	
Statistics .....	3
STAT 512 Statistical Methods (3) or any other STAT course approved by adviser which meets the student's career needs.	
Electives (with adviser's approval) .....	12
	90
See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Education, and other subjects.	

<sup>1</sup> Additional fieldwork may be required to meet on-site requirements and MFCC Educational Verification Requirements.  
<sup>2</sup> Must register for thesis/project credit each quarter of advisement.



## CREDENTIAL PROGRAMS

Candidates for preliminary and clear teaching credentials may complete programs through the Education Department at Cal Poly. Service or specialist credential programs are also available in Administrative Services, Pupil Personnel Services, Reading Specialist, and Special Education Specialist (Learning Handicapped, Severely Handicapped and Resource Specialist). Information about these credentials may be obtained from the coordinator of each program. The Master of Arts in Education section of this catalog contains additional information regarding graduate degree programs which may coincide with fifth year programs and credential programs.

Admission to a credential program requires the candidate's grade point average to be at least equal to the median grade point average of undergraduates in teaching disciplines. Continuation in a credential program requires that the student continue to meet the admission requirements. A minimum GPA of 3.0 in Education classes attempted after program admission is required for recommendation for a credential. (Title 5, *California Administrative Code*, Sections 41100-41103.)

## ELEMENTARY AND SECONDARY TEACHING CREDENTIALS

The following credential programs have been approved by the California Commission for Teacher Credentialing to prepare students for elementary (multiple subject) and secondary (single subject) credentials: Agriculture, Bilingual Emphasis, Biological Sciences, English and Speech Communication, Government, History, Home Economics, Industrial Technology, Liberal Studies (Elementary), Mathematics, Physical Education, Physical Sciences (Chemistry, Physics). Students completing professional clear teaching credentials are referred to as being enrolled in a fifth year of study. The fifth year program may closely coincide with the Master of Arts in Education; however, these are separate programs and require separate applications.

### Prerequisites

Candidates must fulfill a variety of requirements to obtain admission to credential programs. In addition to these requirements, students enrolled in service, specialist, or master's programs will have other requirements to be met. These are explained in the Graduate Programs in Education section of this catalog. The various requirements coincide with the sequential progress Steps I, II, and III. *Application for each step should be submitted only during the last two weeks of the quarter or the first week of the next quarter.* Applications are not accepted during Summer Quarter.

Requirements and steps for preliminary multiple and single subject credentials are explained below:

- STEP I: Applications must be submitted two quarters prior to preliminary (6 unit) student teaching. *Requirements:* A GPA at least equal to the median grade point average of undergraduates in the teaching discipline and evidence of having taken the California Basic Education Skills Test (CBEST), demonstrated competence in reading, writing, and speaking English (see current credential bulletin). In addition, Multiple Subjects students must meet math requirements (see current credential bulletin).
- STEP II: 6 unit student teaching—Applications must be submitted by the first week of the quarter prior to preliminary (6 unit) student teaching. *Requirements:* Meet requirements for Step I; a minimum 3.0 GPA in Education classes attempted after admission; complete prerequisite education course work, subject area course work, and meet California Basic Education Skills Test (CBEST) requirements (see current credential bulletin).
- STEP III: 12 unit student teaching—Applications must be submitted by the first week of the quarter prior to (12 unit) student teaching. *Requirements:* Meet requirements for Step II; a minimum 3.0 GPA in Education classes attempted after admission; be recommended for 12 unit student teaching and meet the California Basic Education Skills Test (CBEST) requirement (see current credential bulletin).

Changes in credential laws and requirements may affect these prerequisites. For current information contact the Credentials Office (Dexter 216).

## **Credential Applications**

Credential applications are available the last two weeks of the quarter in which all requirements are completed for the desired credential. The Cal Poly Credentials Office processes credential applications and forwards them to the Commission on Teacher Credentialing.

Passing the California Basic Education Skills Test (CBEST) is required for all credentials.

Candidates for the secondary teaching credential in agricultural science or the Agricultural Specialist Credential may complete their preparation program through the Agricultural Education Department at Cal Poly. For further information or advisement students should communicate with the Head of the Agricultural Education Department.

## **ADMINISTRATIVE SERVICES**

This program is designed to prepare candidates for the Preliminary Administrative Services Credential which authorizes service in any administrative position, any grade level. It requires 44 quarter units, most of which are applicable to the Master of Arts degree with a specialization in administration.

In consonance with the Master of Arts program, the credential program emphasizes a comprehensive knowledge of public school administration including applied theory of administration and leadership, schools in contemporary society, and effective management related to educational outcomes.

The credential emphasizes applied theory with actual experience in fieldwork assignments and an evaluation of administrative competence as a basis for credential recommendation.

For more information regarding this program, contact the Coordinator, Administrative Services, Education Department.

## **PUPIL PERSONNEL SERVICES**

The Pupil Personnel Services Credential (PPS) is designed to prepare students for counseling and guidance positions in public and private schools in grades K-12. This program stresses applied theory and practical, direct experiences to prepare pupil personnel candidates. A low student-adviser ratio allows for personalized attention. The PPS Credential program has excellent fieldwork placements in K-12 public schools including career centers, continuation schools, and special classes. Required courses are generally offered in late afternoons and evenings.

For more information regarding this program, contact the Coordinator, Counseling and Guidance, Education Department.

## **READING SPECIALIST**

The Reading Specialist Credential program is designed to supplement the basic multiple subject or single subject credential. The Reading Specialist Credential permits the holder to function as a Reading Supervisor, Reading Specialist or Reading Teacher in grades K-12. In order to qualify for admission to the Reading Specialist Credential program the candidate must hold a valid Multiple Subject or Single Subject Preliminary or Life Credential; have completed a reading methods course or the equivalent; and have a grade point average of 3.0 in the last 90 units attempted. The Reading Specialist Credential program consists of 45 quarter units and requires two years of full-time teaching experience and successful completion of a final assessment examination before the credential can be awarded.

For more information, contact the Coordinator, Reading, Education Department.

## SPECIAL EDUCATION SPECIALIST

The Special Education Specialist program is designed to prepare teachers for three advanced credentials: the Learning Handicapped Credential, the Resource Specialist Certificate, and the Severely Handicapped Credential.

*Learning Handicapped Credential:* This program is designed to give students the competencies needed to teach mildly handicapped students ages 3–21 in a special day class setting. This program stresses practical skills across a wide variety of areas.

*Resource Specialist Certificate:* This program is required for those who wish to teach students with a variety of handicapping conditions in a resource specialist program. A valid Special Education Credential and three years of teaching experience (with a minimum of one year of Special Education experience) are required for this certificate.

*Severely Handicapped Credential:* This program is designed for those who wish to teach students ages 3–21 with severe handicaps including the trainable mentally retarded, severely emotionally disturbed, autistic, and multiply handicapped. The training emphasis is upon functional curriculum planning, integration into least restrictive environments, vocational preparation, and community living skills.

The Special Education Specialist program is a graduate program which attempts to accommodate the working professional. Courses are offered during the late afternoon and evening. The unit requirement of 45–47 quarter units for the credential allows the full-time student to complete the requirements in one year. The Special Education program emphasizes a practical orientation to teaching.

In order to be admitted to the program, a candidate must have a baccalaureate degree from an accredited institution, and should have at least a preliminary teaching credential that is valid in California. Included in the selection criteria is a minimum GPA of 3.0 for the last 90 quarter units (60 semester) attempted and passage of CBEST. Applicants must also meet certain personal and professional standards evaluated by required qualifying examinations and personal interviews. Generic courses are open to undergraduate students as per university guidelines.

Units for the Specialist Credential may be applied towards the requirements for a Clear Single or Multiple Subjects teaching credential. It is also possible for qualified students to complete the requirements for the Master of Arts degree in Education while pursuing the Specialist Credential.

For more information regarding this program, contact the Coordinator, Special Education, Education Department.

## GRAPHIC COMMUNICATION DEPARTMENT

### Faculty

#### Department Head, Harvey R. Levenson

Herschel L. Apfelberg  
Michael L. Blum  
Peter R. Del Vaglio  
Gary G. Field

James R. Hutchinson  
W. Stephen Mott  
Patrick A. Munroe  
Philip K. Ruggles

Guy H. Thomas, Jr.  
Joseph W. Truex  
John B. Wordeman

### Programs

B.S. Graphic Communication with Options in:

Computer Graphic Communication	Printing Management
Design Reproduction Technology	Printing Technology

The Graphic Communication Department offers a four-year curriculum leading to the Bachelor of Science degree. The curriculum is designed to prepare graduates for positions of responsibility in the printing, publishing, and packaging industries, and allied professions.

The program provides courses in general education together with a core of printing technology courses. Courses which are specific to one of the curricular options are also provided. The student is introduced to all stages of the printing processes, and chooses a specialized option in the graphic communication field at the appropriate time. The program is not designed to provide vocational training for machine operators. Rather, students are educated for leadership as managers and other skilled professionals who are well grounded in printing technology.

The Graphic Communication Department occupies 33,000 square feet of floor space in the Graphic Arts Building. Theory and practice are taught in modern classrooms incorporating the latest in teaching aids. Fourteen well-equipped laboratories of printing equipment provide the student with diverse experience in the practical aspects of the industry.

### CURRICULAR OPTIONS

#### Computer Graphic Communication

This option is designed for the Graphic Communication major who wishes a career in which computer applications are given prominence. The option prepares the student for careers in computer typography, estimating, scheduling, production management, quality control, and graphic terminal displays.

#### Design Reproduction Technology<sup>1</sup>

The Design Reproduction Technology option prepares technically oriented students for careers in design technology positions in graphic communications. Graduates prepare for a wide variety of positions in publication production, design reproduction, typography, mechanical and electronic preparation of art and copy for reproduction. The program combines a broad technological background in the graphic arts with the principles of design.

<sup>1</sup> The Design Reproduction Technology option of the Graphic Communication Department is distinguished from the Graphic Design option of the Art Department. By focusing on the technical and electronic aspects of transforming design into suitable fashion for reproduction in print media, the option leads positions such as account executive, sales representative, estimator, production coordinator and other positions requiring a technical understanding of design preparation and reproduction.

The Art and Design Department's Graphic Design option focuses on creative problem solving and development of design and layout skills. The option leads to positions such as graphic designer, art director and creative director for advertising agencies, design studios, and corporate design departments.

### Printing Management

This option is designed as a flexible program for the student interested in pursuing employment as a printing plant manager, planner, quality control specialist, production control specialist, estimator, or sales representative. The program also prepares the student for employment as a technical representative for manufacturers of graphic arts machinery and supplies.

### Printing Technology

The Printing Technology option is designed for the student who is interested in the applications of science, engineering, and mathematics to the graphic communication field. The thrust of this option is to assist the technically-oriented student in understanding the scientific forces that impact the graphic communication profession and how to work with the emerging technologies. This program prepares students for careers in quality control, technical and production management, technical sales, product development and other technically-oriented positions.

## CURRICULUM IN GRAPHIC COMMUNICATION

Freshman	F	W	S
GRC 101 Introduction to Graphic Communication .....	2		
GRC 122 Design with Type .....		5	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
CSC 110 Computers and Computing (F.1.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
<sup>1</sup> Mathematics elective (MATH 114/MATH 118/MATH 120)			
(B.2.) .....	3		
PHYS 121, PHYS 122, PHYS 123 General Physics or			
CHEM 121, CHEM 122 General Chemistry and			
CHEM 326 Survey of Organic Chemistry (B.1.) .....	4	4	4
POLS 210 American and California Government (D.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
PE 250 Health Education (E.2.) .....		2	
	16	14	17
<b>Sophomore</b>			
GRC 204 Introduction to Printing Management .....	3		
GRC 223 Copy Preparation for Reproduction .....		3	
GRC 227 Process Camera .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
ECON 211 Principles of Economics (D.3.) .....		3	
ENGL 251/ENGL 252/ENGL 253 Great Books of World			
Literature (C.1.) .....	3	3	
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
<sup>1</sup> Life sciences elective (B.1.b.) .....			3
<sup>1</sup> ART/MU/TH elective (C.2.) .....	3		
Courses to complete major (depending on option) .....	4	2-3	3
Electives .....		2-3	2
	16	17	17

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
GRC 300    Composition Systems I.....	2		
GRC 301    Composition Systems II .....		4	
GRC 311    Substrates and Ink .....			3
GRC 324    Finishing Processes.....	4		
GRC 328    Image Assembly and Platemaking .....	4		
GRC 337    Color Separation Systems .....			2
GRC 357    Screen Processes .....			2
PHIL 230/PHIL 231    Philosophical Classics    (C.1.) .....		3	
PHIL 331    Ethics    (C.3.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (300-400 level)    (C.3.) .....		3	
Courses to complete major (depending on option) .....	8	3	5
Electives .....		2	3
	<u>18</u>	<u>15</u>	<u>18</u>
<b>Senior</b>			
GRC 401    Printing Marketing and Sales .....			3
GRC 403    Estimating.....	4		
GRC 415    Offset Lithographic Presswork .....	5		
GRC 416    Web Printing Technology .....		5	
GRC 417    Advanced Web Printing Technology .....			2
GRC 421, GRC 422    Printing Management .....	4	3	
GRC 437    Consumer Packaging .....		3	
GRC 460    Research Methods in Graphic Communication .....	1		
GRC 461    Senior Project .....			3
ENGR 301    Technology in the 20th Century    (F.2.) .....			3
HIST 315    Modern World History    (D.2.) .....		3	
Courses to complete major (depending on option) .....	4	4	3
	<u>18</u>	<u>18</u>	<u>14</u>

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

## **COMPUTER GRAPHIC COMMUNICATION OPTION**

**(Add courses below to basic curriculum)**

### **Sophomore**

- CSC 101    FORTRAN Programming ..... (2)  
CSC 118    Fundamentals of Computer  
            Science I..... (4)  
CSC 207    BASIC Programming..... (3)

### **Junior**

- EL 219    Logic and Switching Circuits ..... (3)  
GRC 302    New Technologies in Graphic  
            Communication ..... (3)  
CSC 221    Computer Principles and  
            Programming ..... (4)

- CSC 255    Computer Graphics  
            Applications ..... (4)

### **Senior**

- CSC 209    Selected Programming  
            Languages..... (3)  
GRC 331    Color and Quality Control ..... (3)  
GRC 411    Estimating, Pricing and  
            Costing ..... (4)  
GRC 429    Computer Imaging ..... (3)

**DESIGN REPRODUCTION TECHNOLOGY OPTION**

(Add courses below to basic curriculum)

**Sophomore**

- ART 131 2-D Design Fundamentals ..... (3)  
 ART 132 Beginning Color Theory ..... (3)  
 ART 133 Color and Design ..... (3)

- GRC 335 Line and Halftone Media ..... (4)  
 ART 331, ART 332, ART 333 Graphic  
 Design ..... (9)

**Junior**

- GRC 323 Pre-Separated Art for Camera (3)

**Senior**

- GRC 336 Modern Copy Technology .... (4)  
 GRC 439 Advanced Line and Halftone  
 Media ..... (4)  
 GRC 440 Advanced Copy Technology (4)

**PRINTING MANAGEMENT OPTION**

(Add courses below to basic curriculum)

**Junior**

- GRC 302 New Technologies in Graphic  
 Communication ..... (3)  
 GRC 331 Color and Quality Control ..... (3)  
 ACTG 211 Financial Accounting ..... (4)  
 CSC 207 BASIC Programming ..... (3)  
 ECON 212 Principles of Economics ..... (3)  
 MKTG 204 Elements of Marketing ..... (4)

**Senior**

- GRC 326 Printing Equipment  
 Management ..... (3)  
 GRC 408 Newspaper and Publications  
 Management ..... (3)  
 GRC 411 Estimating, Pricing and  
 Costing ..... (4)  
 GRC 423 Printing Management ..... (4)  
 BUS 201 Business Law ..... (3)

**PRINTING TECHNOLOGY OPTION**

(Add courses below to basic curriculum)

**Junior**

- <sup>1</sup> PHYS 121 College Physics or  
 CHEM 121 General Chemistry ..... (4)  
<sup>1</sup> PHYS 122 College Physics or  
 CHEM 122 General Chemistry ..... (4)  
<sup>1</sup> PHYS 123 College Physics or  
 CHEM 326 Survey of Organic  
 Chemistry ..... (4)  
 MATH 131 Technical Calculus ..... (4)  
 CSC 101 FORTRAN Programming ..... (2)  
 GRC 302 New Graphic Technologies .... (3)

**Senior**

- GRC 326 Printing Equipment  
 Management ..... (3)  
 GRC 331 Color and Quality Control ..... (3)  
 GRC 333 Plant Organization and  
 Layout ..... (3)  
 GRC 429 Computer Imaging ..... (3)  
 GRC 432 Analytical Methods for  
 Printing ..... (4)

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Graphic Communication and other subjects.

<sup>1</sup> If students take the physics sequence in general education, then they take chemistry in the option, and vice versa. Students in the Printing Technology option must take one year of physics *and* one year of chemistry.

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## HOME ECONOMICS DEPARTMENT

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### Faculty

#### Department Head, Barbara P. Weber

Connie Breazeale  
Lezlie A. Labhard

Karen S. Moerman  
Nancy A. Morris

Frances J. Parker  
Mildred E. Roske

### Programs

#### B.S. Home Economics

#### M.S. Home Economics

Long noted for its successful preparation of professionals in home economics, the Cal Poly Home Economics Department continues to provide outstanding professional training for its majors. Students from throughout the state are attracted to this program because of excellent faculty, a firm home economics core, outstanding emphasis area courses, and the department's strong commitment to the university's "learn by doing" educational philosophy.

Students have the opportunity to explore the integrative, holistic nature of home economics which includes the study of individuals and families in their near environment; human growth and development; the interrelationships of individuals of all ages and socio-economic levels; the interdependence of food and nutrition as they influence human behavior and health; the relationship of design, technology, and environment to human behavior; and management theory, application and family decision-making behavior.

Emphasis areas include General Home Economics, Home Economics Education, Interior Design, and Textiles/Clothing Merchandising.

Students selecting the emphasis area in General Home Economics obtain a professional education of maximum breadth and depth for employment in business, industries, and institutions whose various products and services require broad home economics expertise. A wide range of additional professional courses in foods and consumer economics to meet individual career goals may also be selected.

Students selecting the emphasis area in Home Economics Education are offered the opportunity to obtain a professional education focusing on specific breadth and depth in major home economics subject areas and on the education competencies required for obtaining a secondary credential in home economics.

An emphasis in Interior Design offers students a professional education focusing on the specific knowledge and technical skills required in the practice of residential and contract interior design for employment in design studios, design firms, architectural firms, and in related wholesale and retail businesses. Students select 38 units of course work in consultation with an adviser. Subjects studied usually include fundamentals of drawing, materials of construction, design fundamentals, introduction to drawing and perspective, basic graphics, human factors for environmental designers, history of interior design, individual residential design, interior design materials and techniques, barrier free environments, and advanced interior design.

An emphasis in Textiles/Clothing Merchandising offers students a professional education focusing in-depth on specific knowledge in textiles and clothing subjects, for employment in textile and clothing industries and in fashion and textiles merchandising at both wholesale and retail levels. Students select 32 units of course work in consultation with an adviser. Subjects studied usually



include clothing construction, principles of management, creative textiles, clothing and the individual, flat pattern, advertising, principles of purchasing, elements of marketing, financial accounting for nonbusiness majors, and tailoring.

Facilities include well-equipped laboratories for foods and household equipment, interior design, clothing, and textiles.

The Home Economics program is accredited by the American Home Economics Association.

## CURRICULUM IN HOME ECONOMICS

### Freshman

	F	W	S
<sup>1</sup> HD 108 Introduction to Human Development .....		3	
HE 121 Fundamentals of Foods.....			4
HE 122 Design Analysis .....	3		
HE 220 Contemporary Textile Products .....			3
ENGL 114 Writing: Exposition (A.1.).....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 114 College Algebra (B.2.).....	3		
ART 111 Introduction to Art or			
ART 112 Survey of Western Art (C.2.) .....		3	
HE 101 Home Economics as a Profession.....	2		
SOC 105 Introduction to Sociology (D.4.a.) .....			3
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....		4	4
Electives.....	4	4	3
	16	17	17

### Sophomore

ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
HE 203 Consumer Role of the Family .....	3		
STAT 211 Elementary Probability and Statistics (B.2.) .....	3		
HE 207 Problems of Family Housing .....		3	
HE 210 Nutrition (E.2.) .....			3
HD 203 Family Development .....			3
HE 242 Interior Design .....			4
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....	3		
<sup>2</sup> Life sciences elective (BACT 221, BOT 121, ZOO 131, or BIO) (B.1.b.) .....		4	
<sup>2</sup> Literature, philosophy, arts elective (330–400 level) (C.3.) .....		3	
Electives.....	4	3	3
	16	17	16

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
HE 322 Textiles .....	3		
HE 324 Management of Family Resources .....			3
HE 326 Demonstration Techniques.....			3
HE 331 Household Equipment.....		4	
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
POLS 210 American and California Government (D.1.) .....		3	
HE 341 Clothing and Human Behavior .....		3	
<sup>2</sup> Computer literacy elective (F.1.) .....			3
<sup>2</sup> Critical reading-English (C.1.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>3</sup> Restricted electives.....	8	7	4
	17	17	16
<b>Senior</b>			
HE 461, HE 462 Senior Project .....	3	3	
HE 463 Undergraduate Seminar .....	2		
HIST 315 Modern World History (D.2.) .....		3	
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....	3		
<sup>2</sup> Technology elective (F.2.) .....			3
<sup>4</sup> Restricted electives.....	9	8	9
	17	17	15

<sup>1</sup> HD 130 may be substituted with prior approval of adviser.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>3</sup> To be selected with adviser approval. At least 6 units must have HE 300 series level prefix.

<sup>4</sup> To be selected with adviser approval. At least 12 units must have HE 400 series level prefix.

## MASTER OF SCIENCE IN HOME ECONOMICS

The Master of Science degree in Home Economics is designed to provide appropriate graduate level courses for: (1) job-entry level of competence for instructors of home economics in community colleges, (2) upgrading teachers now in the field, (3) qualifying students for continued graduate work at other institutions, (4) developing ability for self-directed study and growth, (5) international students, (6) professional competence for employment in business, extension, community, and civil service.

The degree study plan must include 45 units of adviser-approved graduate work, at least 24 of which must be at the 500 level. Student teaching will not be accepted as credit toward the degree program. A minimum overall grade point average of 3.0 is required in all units attempted subsequent to admission to the program. Any course grade less than a C will not be accepted as meeting unit requirements for the degree. All candidates must meet the current Graduation Writing Requirement (see page 119).

Although only 9 units of credit may be applied to the degree requirements, students must enroll in HE 599 Thesis for every quarter in which they are receiving advisement.

For further information or advisement students should communicate with the head of the Home Economics Department or the Graduate Program Coordinator.

## CURRICULUM FOR THE MASTER OF SCIENCE DEGREE IN HOME ECONOMICS

	<i>Units</i>
Required courses.....	12
HE 511 Research Design or ED 582 or ED 585 (3)	
HE 580 Seminar (3)	
<sup>1</sup> HE 599 Thesis (3) (3)	
or additional approved course work and comprehensive examination (9)	
Courses in the general field of Home Economics and in major area(s) of interest selected from 400 and 500 series level .....	27
Electives selected from 400 and 500 series level .....	6
	45

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Home Economics and other subjects.

<sup>1</sup> Must register for thesis credit each quarter of advisement.

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## INDUSTRIAL TECHNOLOGY DEPARTMENT

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### Faculty

#### Department Head, Laurence F. Talbott

William C. Chambers  
Larry W. Gay  
Roger L. Keep

Lynn S. Mosher  
James L. Murphy  
Anthony J. Randazzo

Nelson L. Smith, III  
Raymond A. Wysock

### Programs

B.S. Industrial Technology  
with Options in:  
Industrial Education  
Industrial Management

M.A. Industrial and Technical Studies

The Industrial Technology Department offers two degree programs: 1) Bachelor of Science in Industrial Technology, and 2) Master of Arts in Industrial and Technical Studies. This department also administers the Bachelor of Vocational Education program.

Industrial Technology is defined by the National Association of Industrial Technology as a baccalaureate degree program designed to prepare individuals for technical managerial, production supervisory, and related types of professional leadership positions.

The Bachelor of Science program in Industrial Technology has two options which prepare graduates for employment in a broad range of professional positions in industry (Industrial Management) and education (Industrial Education).

### CURRICULAR OPTIONS

#### Industrial Education

This option provides undergraduate professional preparation of industrial education teachers for secondary schools, community colleges, and industry. The curriculum provides for instruction and laboratory experiences in drafting, wood technology, industrial plastics, electricity, electronics, metal technology, power technology, automotives, and graphic arts as a teaching specialization. Graduates of this option have an extensive understanding of industrial manufacturing procedures plus the ability to work well with students, helping them to become familiar with the processes of industry. The Single Subjects Credential (for secondary teaching) is available as part of this program. The Designated Subject Credential and the Bachelor of Vocational Education degree are administered under this option.

#### Industrial Management

This option emphasizes preparation for technical leadership responsibilities with a broad variety of industries including manufacturing, communication, transportation and utility services. Graduates in the field of industrial management function in the mid-ground between the applied aspects of engineering and administration. Students who enjoy working primarily with people in solving technical problems are particularly well suited for careers in industrial technology. Preparation for professional specialization in industrial sales, production and quality management, or plant facilities management, is provided through the selection of appropriate electives.

**CURRICULUM IN INDUSTRIAL TECHNOLOGY****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
IT 101 Technical Problem Solving .....	3		
IT 245 Technical Sketching .....		2	
ETME 142, ETME 143 Engineering Drawing I, II or			
IT 235 Industrial Drawing .....			2
<sup>1</sup> MATH 120 College Algebra and Trigonometry (B.2.) .....	5		
GEOG 150 Human Geography (D.4.a.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PHYS 121, PHYS 122 College Physics (B.1.a.) .....		4	4
CSC 101 Fortran Programming (F.1.) .....		2	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
BIO 101 General Biology (B.1.b.) .....	3		
Electives and courses to complete option .....		7	7
	18	18	17

**Sophomore**

PSY 201/PSY 202 General Psychology (E.1.) .....			3
IT 237, IT 238 Industrial Electricity .....	3	3	
STAT 211 Elementary Probability and Statistics .....		3	
<sup>2</sup> Critical reading electives (C.1.) .....	3	3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
ECON 211, ECON 212 Principles of Economics (D.3.) .....	3	3	
PE 250 Health Education (E.2.) .....			2
CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
IT 229 Industrial Materials .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
Electives and courses to complete option .....			6
	16	16	17

**Junior**

HIST 315 Modern World History (D.2.) .....	3		
GEOG 308 Global Geography (D.4.b.) .....	3		
IT 322 Energy and Power .....		4	
IT 305 Technical Presentations .....		3	
IT 311 Plant Safety Fundamentals .....			3
IT 333 Electronic Computer Applications .....			4
IT 326 Product Development and Evaluation .....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
PHIL 315/PHIL 321/PHIL 331/PHIL 333/PHIL 335 (C.3.) .....	3		
Electives and courses to complete option .....	6	6	6
	15	16	16

**Senior**

IT 433 Production and Process Management .....			3
IT 461 Senior Project .....		3	
IT 463 Industrial Technology Seminar .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
POLS 210 American and California Government (D.1.) .....			3
HUM 402 Values and Technology (C.3.) .....	3		
Electives and courses to complete option .....	7	14	10
	16	17	16

<sup>1</sup> MATH 118 and MATH 119 or MATH 114 and MATH 115 may be used in lieu of Math 120.<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

**INDUSTRIAL EDUCATION OPTION**

(Add courses below to basic curriculum)

**Freshman**

IT 125 Wood Processes ..... (3)

**Sophomore**

IT 250 Transportation Power ..... (3)

**Junior**

IT 327 Plastics Technology ..... (3)

IT 353 Furniture Design and Construction ..... (3)

<sup>1</sup> ED 302 Multicultural Education in the Secondary School ..... (3)<sup>1</sup> ED 305 Teaching and Learning Processes ..... (3)<sup>1</sup> ED 405 Diagnostic, Prescription and Evaluation ..... (2)<sup>1</sup> ED 409 Teaching in the Secondary School ..... (3)<sup>2</sup> IT 418 Technical Management Problems..... (4)<sup>2</sup> IT 405 Industrial Marketing..... (3)<sup>2</sup> ACTG 211 Financial Accounting for Nonbusiness Majors ..... (4)**Senior**

IT 424 Curriculum and Methods of Industrial Education ..... (3)

IT 443 General Metals ..... (3)

IT 444 Technical Drawing ..... (3)

**INDUSTRIAL MANAGEMENT OPTION**

(Add courses below to basic curriculum)

**Freshman**

Manufacturing Processes ..... (1)

MATH 131 Technical Calculus ..... (4)

**Sophomore**

ACTG 211 Financial Accounting for Nonbusiness Majors ..... (4)

**Junior**

IT 331 Advanced Industrial Electrical Systems ..... (4)

IT 332 Electronic Control Systems ..... (4)

MGT 311 Industrial Management ..... (4)

**Senior**

IT 418 Technical Management Problems ..... (4)

IT 431, IT 432 Mechanical Systems ..... (6)

<sup>1</sup> For those planning to seek a secondary school teaching credential.<sup>2</sup> For those planning to teach technical subjects in community college or for industry.**MASTER OF ARTS DEGREE IN INDUSTRIAL AND TECHNICAL STUDIES**

This program provides preparation for professional responsibilities including leadership in industrial education. Industrial Education is defined by the National Association of Industrial and Technical Teacher Educators as a broad generic term that encompasses industrial arts, trade and industry and technical education. It is designed to be of practical value to secondary school and community college instructors in industrial arts and trade-technical subjects. It also will aid those preparing for administrative positions in these areas. The program meets the requirements for the California Single Subject Teaching Credential. The master's degree is required for credentialing to teach at the community college level.

The curriculum includes opportunity for obtaining knowledge and skills at advanced levels in technical areas and covers aspects common to current industrial education in curriculum development, facilities, trends, organization, administration and research. Graduates are prepared to accept positions in industry as instructors and coordinators of industrial training programs.

The primary characteristic of this degree program is its emphasis upon professional attitudes and technical preparation of individuals for careers and leadership in industrial education in industry, community colleges, and public schools. The program of study incorporates in-depth professional studies in the field of industrial education as well as related graduate course work from the Education Department. Provisions are made for additional technical elective work within industrial education as well as for other elective courses including technical management.

**Prerequisites**

Admission as a degree student in this program requires a 2.5 minimum grade point average or 2.5 in the last 90 units of course work taken to satisfy the requirements for the baccalaureate degree. Advancement to candidacy requires completion of 12 units of courses specified in a formal program of study with a minimum grade point average of 3.0.

**Conditionally Classified Standing**

The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

For information pertaining to specific requirements for admission to graduate standing-classified or graduate standing-conditionally classified, the student should communicate with the head of the Industrial Technology Department or the Department Graduate Coordinator.

**Program of Study**

The Master of Arts degree in Industrial and Technical Studies is a three quarter integrated program of 45 units of graduate work commencing in any quarter of each year for students who have a baccalaureate degree in Industrial Arts, Industrial Education, or who have comparable technical and professional preparation related to industrial education. Professional courses at the 500 level are also offered in the summer. A thesis, project, or comprehensive examination is required.

A minimum grade point average of 3.0 must be maintained in all courses taken to satisfy the requirements for the degree. All candidates must meet the current Graduation Writing Requirement (See page 119).

Students accepted into the program without a baccalaureate in Industrial Education, Industrial Arts or comparable preparation, are required to take prerequisite courses as stipulated by the Industrial Technology Department Graduate Coordinator. The student should also check with the Coordinator to determine those courses in the master's curriculum which can be taken concurrently with the specified prerequisite work.

**CURRICULUM FOR THE MASTER OF ARTS DEGREE IN INDUSTRIAL AND TECHNICAL STUDIES**

	<i>Units</i>
Required Courses .....	29
IT 505 Experimental Projects in Technology (3)	
IT 515 History and Philosophy of Industrial Education (3)	
IT 520 Organization and Administration of Industrial Education (3)	
IT 521 Curriculum in Industrial Education (3)	
IT 522 Facility Planning in Industrial Education (3)	
IT 527 Trends and Issues in Industrial Education (3)	
IT 580 Graduate Research in Industrial Education (3)	
ED 581 Graduate Seminar in Education—Tests and Measuring in the Classroom (3)	
<sup>1</sup> IT 599 Industrial Education Thesis or Project (5)	
Professional education courses .....	6
Courses in professional education at the 500 level chosen with approval of the adviser	
Technical electives .....	10
Technical electives in courses applicable to communications, manufacturing, and transportation chosen with adviser approval.	

45

See COURSES OF INSTRUCTION section of the catalog for description of courses in Industrial Technology and other subjects.

<sup>1</sup> The student may be permitted a nonthesis/project option by accomplishing all of the following steps: 1) Obtaining approval of the adviser and the Graduate Studies Committee. 2) Substituting 5 units of 500-level course work which support this professional degree and are approved in advance by the above committee. IT 500 Individual Study (1-6) is recommended. 3) Passing a comprehensive written examination covering the graduate program.

# LIBERAL STUDIES

## An Interdisciplinary Program

### Faculty

Coordinator, Margaret J. Glaser

### Programs

#### B.A. Liberal Studies

The Bachelor of Arts in Liberal Studies is a degree major designed to provide undergraduate preparation for the student who intends to satisfy requirements for a teaching credential authorizing multiple subject instruction, i.e., elementary school teaching.

Students who find the teaching credential objective unrealistic after pursuing the Liberal Studies major to the point of entry into the university credential program or students who do not desire a teaching credential may complete a B.A. in Liberal Studies by satisfying the noncredential emphasis on the curriculum display below. Applications for, or changes of major into, the Liberal Studies major will be discouraged from any student who does not have the minimum scholastic standing necessary for successfully completing the multiple subjects teaching credential program as constituted on this campus.

### CURRICULUM IN LIBERAL STUDIES

Freshman	F	W	S
BIO 127, BIO 128, BIO 129 Natural History (B.1.b.) .....	3	3	3
<sup>1</sup> MATH 114 College Algebra (B.2.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/SPC 125 Critical Thinking (A.2.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
<sup>2</sup> Technology elective (F.2.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....			3
HIST 101/HIST 102/HIST 103 History of Western Civilization ....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
ART 111 Introduction to Art or			
ART 112 Survey of Western Art (C.2.) .....	3		
Elective .....		3	
	16	15	15



**Sophomore**

	F	W	S
PSC 101, PSC 102 The Physical Environment (B.1.a.) .....	4	4	
PSC 303 Earth and Space Science .....			4
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
ENGL 260 Children's Literature .....		3	
SPC 310 Performing Literature in the Classroom .....		3	
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
ENGL 251/ENGL 252/ENGL 253 Great Books of World			
Literature (C.1.) .....	3		3
CSC 410 Computer Fundamentals for Educators (F.1.) .....			3
PE 250 Health Education (E.2.) .....	2		
Foreign language (one language) electives (C.3.) .....	5	5	
MU 204 Appreciation of Music.....			3
	17	15	17

**NONCREDENTIAL EMPHASIS**

**Junior<sup>3</sup>**

MATH 327, MATH 328, MATH 329 Modern Elementary Math			
(B.2.) .....	3	3	3
GEOG 308 Global Geography (D.4.b.) .....			3
ENGL 302 Advanced Composition or			
ENGL 392 Contemporary Grammar and Composition .....	4		
ANT/GEOG/HIST/PSY/SOC/SOCS elective (300-400) level .....	3		
HIST 315 Modern World History (D.2.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>2</sup> ENGL restricted elective (300-400 level) (C.3.) .....		3	
MU 100 Music Fundamentals .....	3		
MU 301 Music for Children.....			3
GEOG 340 Geography of California or			
HIST 385 Topics in California History.....		3	
Restricted electives .....		3	5
	16	15	14

**Senior**

ART elective .....		3	
Restricted electives .....	6	9	13
LS 461 Senior Project .....	3		
TH 380 Children's Theatre.....	3		
Electives.....	3	3	3
	15	15	16

<sup>1</sup> MAPE test results may waive this course. Units then may be used for other math or science courses at discretion of adviser.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>3</sup> Two emphases of at least 18 units must be acquired within the total degree program, at least 12 units of each emphasis must be 300-400 level course work. The two emphases and the courses are to be selected with the adviser's approval.

**CREDENTIAL EMPHASIS**

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
HIST 315 Modern World History (D.2.) .....	3		
MATH 327, MATH 328, MATH 329 Modern Elementary Mathematics .....	3	3	3
GEOG 308 Global Geography (D.4.b.) .....	3		
ENGL 302 Advanced Composition or ENGL 392 Contemporary Grammar and Composition .....	4		
MU 100 Music Fundamentals .....	3		
MU 301 Music for Children .....			3
GEOG 340 Geography of California or HIST 385 Topics in California History .....		3	
ANT/HIST/PSY/SOC/SOCS elective (300–400 level) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
ED 301 Multicultural Education in the Elementary School .....			3
ED 305 Teaching and Learning Processes .....		3	
ED 401 Reading Methods in the Elementary School .....			3
<sup>2</sup> ENGL elective (300–400 level) (C.3.) .....		3	
	16	15	15
<b>Senior</b>			
ED 402 Field Experience in Elementary School Reading .....	3		
ED 407 Teaching Language Arts in the Elementary School .....	3		
ED 408 Teaching Science and Social Studies in the Elementary School .....	3		
ED 410 Preliminary Student Teaching .....		6	
ED 411 Organization and Management in the Elementary School .....		3	
ED 420 Student Teaching .....			12
ED 421 Senior Project/Practicum (Multiple Subjects) .....			2
TH 380 Children's Theatre .....	3		
ART elective .....	3		
Electives .....		7	
	15	16	14

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## MILITARY SCIENCE DEPARTMENT

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### Faculty

#### Department Head, Lt. Colonel Carl L. Collins

Major Robert A. Parr III  
Major Lawrence W. Stayton

Captain Edward E. Hampton, Jr.  
Captain Henry L. Bryan

### PURPOSE

The Military Science Department conducts a program of instruction which develops the mental and physical qualifications of graduates in preparation for positions of leadership within the military and/or civilian communities. Both men and women students may enroll for full academic elective credit without incurring any military service obligation. Courses complement all major areas of study by broadening the student's basic education. The curriculum includes both military leadership and management courses, and courses which provide an awareness of the heritage of the U.S. Military: the Armed Forces role in national defense strategy; professional military subjects and military ethics. Students desiring to attain a commission as a Second Lieutenant in the U.S. Army must meet eligibility requirements and complete the entire Military Science/ROTC (Reserve Officer Training Corps) Advanced Course. To be eligible for participation in ROTC, a student must be full time (12 units) and enrolled at Cal Poly, have sufficient time remaining as a university student to permit completion of the advanced course prior to reaching the 30th birthday, and be physically qualified.

### FINANCIAL ASSISTANCE

ROTC scholarships are available on a competitive basis which provide full tuition, books, supplies, and an allowance of \$100 per month for the duration of the scholarship. Nonscholarship ROTC cadets also receive an allowance of \$100 per month while enrolled in the advanced course. Students who are members of the National Guard or Army Reserves may participate in the ROTC Advanced Course simultaneously. Students involved in both can receive up to \$10,000 in four years of college. Students interested in scholarship competition should contact the Military Science Department at the time of application to the university.

### EQUIPMENT AND UNIFORMS

All necessary equipment, uniforms and textbooks for participation in the Military Science/ROTC program are furnished to the student by the United States Government free of charge. Title to this property, other than expendable items, remains with the government. Students entering into active commissioned service after graduation are granted a special \$300 uniform allowance.

### FOUR-YEAR PROGRAM

The four-year elective ROTC program is a progressive course of instruction divided into a two-year basic course and a two-year advanced course.

Students with previous military service, or with Junior ROTC credit or ROTC credit from another institution, may be granted advanced standing in the program. Students who will complete degree requirements in three academic years may enroll in first-year and second-year ROTC courses concurrently and complete the four-year program in three years.

Students who elect to enter the Advanced Course of ROTC instruction are paid \$100 per month while enrolled. The ultimate obligation connected with the receipt of this subsistence allowance is the willingness by the student to accept a reserve commission of Second Lieutenant if it is offered upon graduation and to serve a period of four years on active duty or a period of eight years of reserve duty as a commissioned officer.

## **312 Military Science**

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Four-year program students are required to attend summer training camp for a six-week period following completion of their third year. The government furnishes all uniforms, equipment, room, board, and medical care for students at camp. Additionally, each student is paid at the rate prescribed by law for cadets at the U.S. Military Academy and is provided a transportation allowance from and to home. No university credit is accrued for the advanced summer camp.

### **TWO-YEAR PROGRAM**

The opportunity offered by ROTC training is available in a special program to transfer students and to currently enrolled college students who were unable to participate in the four-year ROTC program.

To qualify for the two-year program, the student must complete a special ROTC summer Basic Camp of six weeks duration. Students normally attend Basic Camp between their second and third academic years. Transfer students must complete the camp during the summer immediately prior to their matriculation at Cal Poly. It is important that potential transfer students who plan to participate in the two-year ROTC program make their intentions known directly to the Military Science Department no later than March 1 of the year they plan to register at the university even though this date may precede the date of their final acceptance by the university.

The government will provide a transportation allowance to and from Basic Camp and pay at the rate of one-half of a Second Lieutenant's basic pay. All equipment, uniforms, room, board and medical care are furnished free while at camp. Basic Camp is in addition to the advanced camp requirement. A maximum of 7 units elective credit maybe earned for attending Basic Camp. No military obligation is incurred as a result of attendance.

Upon successful completion of the Basic Camp, the student can voluntarily be admitted into the advanced ROTC course during fall registration. The student is entitled then to the advanced course subsistence allowance and all other privileges of advanced course standing as enumerated above under the four-year program.

Students who are unable to attend the Basic Camp may still qualify for the advanced course by participating in a series of courses offered during the summer quarter. This program is a combination of academic courses and practical application designed to bring a participating student to the same level as those who attend either the first two years of the four-year program or the Basic Camp. Students satisfactorily completing this program earn 6 units of academic credit and may be admitted directly into the advanced ROTC course during the fall quarter.

### **MODULAR PROGRAM**

Basic course students are offered an alternative to the courses of instruction for which academic elective credit is given. The modular program may be substituted for the four-year program basic course, and is based on practical application through activity participation rather than the academic curriculum. A variety of skill and adventure modules, for which no elective credit units accrue, are offered and may be pursued solely or in combination with the academic curriculum to qualify for entry directly into the advanced ROTC course. Cadets so qualifying for the advanced course receive the subsistence allowance and all other privileges of advanced course standing as enumerated above under the four-year program. Students desiring to participate in the modular program do so by contacting the enrollment officer of the Military Science Department.

### **SIMULTANEOUS MEMBERSHIP PROGRAM**

Students can serve simultaneously in the National Guard or Army Reserves and ROTC and receive pay from both sources. Those who complete the ROTC Advanced Course prior to graduation are eligible for the Early Commissioning Program. Since students can earn up to \$10,000 in four years of college this program provides both financial and experience benefits.

### **EARLY COMMISSIONING PROGRAM**

Students who complete ROTC requirements prior to graduation will be commissioned early and may enter the National Guard or Army Reserves as Second Lieutenants. These students would be expected to complete their undergraduate work and could remain in the Guard or Reserves or request entrance into active duty upon graduation.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Military Science and other subjects.

## PHYSICAL EDUCATION AND RECREATION ADMINISTRATION DEPARTMENT

### Faculty

#### Department Head, Dwayne G. Head

Doris Acord  
Katharine Barthels  
Victor A. Buccola  
F. Stuart Chestnut  
Rudolph H. Dressendorfer  
Sonja M. Glassmeyer  
F. Sheldon Harden

Vaughan Hitchcock  
Lynn M. Jamieson  
Thomas J. Lee  
Robert E. Meyers, Jr.  
Raymond Nakamura  
Andrew J. Proctor

Jimmy H. Railey  
Carolyn B. Shank  
Mary L. Stallard  
Michael Swiderski  
James L. Webb  
Marylinda Wheeler

### Programs

#### B.S. Physical Education

with Options in:

Commercial/Corporate Fitness  
Health Education  
Teaching

#### M.S. Physical Education

#### B.S. Recreation Administration

with Concentrations in:

Private/Commercial Recreation  
Therapeutic Recreation

The Physical Education and Recreation Administration Department offers undergraduate degree programs in physical education and recreation administration with a graduate degree program in physical education. The department also contributes to the general education and elective needs of all students by providing health education, physical education activity, and first aid/CPR courses.

Because of an ideal geographical location, the university has become a center for workshops held by some of the State's health and physical education organizations.

The department has a full range of both indoor and outdoor facilities and laboratories which accommodate an extensive physical education instructional program as well as full-scale athletic, intramural, and recreational sports programs.

### PHYSICAL EDUCATION MAJOR

The Bachelor of Science degree in Physical Education is a broad based program offering students curricular choices for a wide range of career opportunities. These choices include the traditional options in teaching and health education and the contemporary choices of a commercial/corporate fitness option and certificate programs in athletic coaching and aquatic specialist. The major also offers an individualized course of study which allows a student to design his/her curricular focus on an interdisciplinary basis.

### Curricular Options

#### Teaching

This option provides course work which enables graduates to enter the teaching profession with the knowledge and skills necessary to achieve maximum success within each person's capabilities. The single subject credential in physical education and an Adapted Physical Education Emphasis credential are available as part of the program.

**Health Education**

This option is designed to prepare students for careers in education, public/private health related agencies and for graduate school in the health sciences. The option focuses on working with others to enhance the quality of life through the mediums of physical and mental health.

**Commercial/Corporate Fitness**

This option incorporates basic knowledge of business and managerial skills with the scientific and clinical knowledge of exercise physiology, human chemistry, psychology and nutrition. These graduates work in a wide range of enterprises which include: fitness programs, YMCA/YWCA, private health clubs and various wellness evaluation/rehabilitation programs.

**CURRICULUM IN PHYSICAL EDUCATION****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
MATH 114 College Algebra (B.2.) .....	3		
PE 250 Health Education .....			2
PE 206-241 Professional Activity/Fitness electives .....		3	1
<sup>1</sup> Physical sciences elective (B.1.a.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
ZOO 131 General Zoology (B.1.b.) .....			4
PE 270 Introduction to Physical Education .....	2		
ECON 201/ECON 211/ECON 222 (D.3.) .....			3
PE 280 First Aid and CPR .....	3		
SPC 202 Principles of Speech (A.3.) .....			3
POLS 210 American and California Government (D.1.) .....		3	
<sup>1</sup> Computer literacy elective (F.1.) .....			3
Electives and courses to complete major .....	4	2	1
	16	17	17

**Sophomore**

PE 218 Aquatics .....		2	
STAT 211 Elementary Probability and Statistics (B.2.) .....	3		
STAT 212 Statistical Methods (B.2.) .....		3	
PE 206-229 Professional activity elective .....		2	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
PE 206 Tumbling-Vaulting or			
PE 207 Apparatus .....			2
DANC 211 Orientation to Dance .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
ZOO 237 Human Anatomy and			
ZOO 300 Human Physiology .....	3	5	
PE 252 Beginning Athletic Training .....	2		
HE 210 Nutrition (E.2.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
Electives and courses to complete major .....	2	3	4
	17	15	15

Junior	F	W	S
<sup>2</sup> ENGL 302 Writing: Advanced Composition or			
ENGL 310 Corporate Communications .....	4		
ZOO 340 Human Muscle Anatomy (B.1.b.) .....	2		
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
PE 302 Mechanical Kinesiology .....		4	
HIST 315 Modern World History (D.2.) .....			3
PE 303 Physiology of Exercise .....			4
PE 319 Measurement and Evaluation in Physical Education .....	4		
PE 402 Introduction to Motor Learning .....		3	
ENGL 251/ENGL 252/ENGL 253/Great Books of World			
Literature (C.1.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....	3		
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
Electives and courses to complete major .....	3	4	7
	16	17	17
<b>Senior</b>			
PE 406 Adaptive Physical Education .....			4
PE 461, PE 462 Senior Project .....	3	2	
PE 412 Contemporary Issues in Sport .....			3
PE 401 Organization and Administration of Health and			
Physical Education .....	3		
PE 474 History and Philosophy of Physical Education .....		3	
PHIL 331 Ethics (C.3.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>1</sup> Technology elective (F.2.) .....		3	
Electives and courses to complete major .....	8	6	7
	17	17	17

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> Students in teaching option must take ENGL 302.

## COMMERCIAL/CORPORATE FITNESS OPTION

(Add courses below to basic curriculum)

### Freshman

MGT 118 Introduction to Human  
Relations in Business..... (3)

### Sophomore

MKTG 204 Elements of Marketing..... (4)  
MGT 201 Principles of Management..... (3)  
REC 210 Programming for Leisure..... (3)

### Junior

CHEM 326 Survey of Organic  
Chemistry..... (4)  
CHEM 328 Biochemistry..... (4)

PE 445 Principles of Electro-  
cardiography and EKG Interpretation ... (3)  
PE 451 Nutrition for Fitness and Sport .. (3)

### Senior

PE 434 Foundation for Development of  
Conditioning Programs..... (2)  
PE 450 Lifestyle Management in a  
Physical Fitness Setting..... (3)  
PE 452 Testing and Exercise  
Prescription for Fitness Specialists..... (3)  
PE 437 Directed Field Work..... (4)

**HEALTH EDUCATION OPTION**

(Add courses below to basic curriculum)

**Freshman**

- PE 254 School Health Program ..... (2)  
 HD 108 Introduction to Human  
 Development or SOC 206 The  
 Sociology of Family Life ..... (3)

**Sophomore**

- BIO 253 Orientation to the Health  
 Professions (1) or SOC 377 Health,  
 Culture and Society ..... (3)  
 BACT 221 General Bacteriology ..... (4)  
 PSY 317 Psychology of Stress ..... (3)

**Junior**

- BIO 301 Human Ecology ..... (3)

- PSY 301 Psychology of Personal  
 Development ..... (3)  
 PSY 305 Human Sexuality ..... (2)  
 SOC 344 Sociology of Poverty or  
 GEOG 320 Geography of Hunger ..... (3)

**Senior**

- PSY 320 Behavioral Effects of Drugs  
 and Alcohol ..... (3)  
 BIO 302 Human Genetics ..... (3)  
 PE 405 Administration of Health  
 Education ..... (2)  
 HD 425 Adulthood and Aging or  
 PSY 459 Lifespan Development ..... (3)

**TEACHING OPTION**

(Add courses below to basic curriculum)

**Freshman**

- PE 206-229 Professional activity elective (2)  
 PE 254 School Health Program ..... (2)  
 PE 284 Water Safety ..... (1)

**Sophomore**

- PE 206 Tumbling-Vaulting or  
 PE 207 Apparatus ..... (2)  
 REC 260 Intramural/Recreational  
 Sports ..... (3)  
 PE 275 Sports Officiating ..... (2)  
 PE 296 Planning Techniques in Physical  
 Education ..... (3)

**Junior**

- PE 332 Teaching Elementary Physical  
 Education ..... (4)  
 PE 375 Teaching Secondary Physical  
 Education ..... (4)  
 PE 312, PE 321, PE 322, PE 323/PE 325, PE  
 327, PE 344, PE 356, PE 379 Coaching  
 Methods ..... (6)

**Senior**

- PE 440 Physical Education Practicum .. (2)  
 PE 434 Foundations for Development  
 of Conditioning Programs ..... (2)  
 DANC 381/DANC 383/REC 301 ..... (3)  
 PE 424 Organization and Teaching  
 Physical Education ..... (3)

**Certificate Programs/Individualized Course of Study**

In addition to the options, students may pursue department approved individual course of study and certificate programs. For majors other than physical education, the department offers certificate programs in athletic coaching and aquatics.

Physical education majors who select the athletic coaching certificate would also have to complete another certificate program, option, or individualized course of study.



## RECREATION ADMINISTRATION MAJOR

Organizations offering leisure services and products exist as a result of the demand for increased leisure opportunity. The Bachelor of Science degree program in Recreation Administration offers professional preparation for employment in public, private, and commercial leisure service organizations. Students may pursue a concentration in either private/commercial recreation or therapeutic recreation or elect to develop an emphasis in selected programming areas to include: outdoor/recreation education, aquatics, cultural arts, recreational sports and dance. In addition, leisure education courses provide university students with lifestyle management skills.

### Curricular Concentrations

#### Private/Commercial Recreation

This concentration emphasizes preparation for employment in organizations that provide leisure products or services for profit or financial self-sufficiency. An emphasis on recreation business is targeted to the following settings: employee services and recreation, travel and tourism, product sales and manufacturing, and small business opportunities.

#### Therapeutic Recreation

This concentration prepares students for employment in recreation therapy, leisure education for the disabled, and special recreation in such settings as hospitals, correctional institutions, health organizations, residential care facilities, and community-based agencies and organizations.

## CURRICULUM IN RECREATION ADMINISTRATION

### Freshman

	F	W	S
REC 101 Introduction to Recreation and Leisure Services.....	3		
REC 102 Wilderness Ethics and Safety .....		2	
REC 105 Recreation Leadership.....			3
BIO 127/BIO 128/BIO 129 Natural History (B.1.b.).....	3		
CSC 110 Computers and Computing (F.1.).....		3	
ACTG 211 Financial Accounting for Nonbusiness Majors.....			4
BUS 101 The Business Enterprise .....		4	
ENGL 114 Writing: Exposition (A.1.) .....	4		
PE 143 Advanced Lifesaving or adviser approved elective .....		1	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
MATH 114 College Algebra (B.2.).....		3	
<sup>1</sup> Physical or life sciences elective (B.1.) .....	3		
ASTR 101/ASTR 102/GEO 204 (B.1.a.).....			3
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....			3
Electives and courses to complete concentration .....		4	
	16	17	16

### Sophomore

REC 210 Programming for Leisure .....			3
REC 252 Recreation for People with Disabling Limitations .....		4	
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
GEO 201 Physical Geology (B.1.a.).....	3		
HIST 204 History of American Ideals and Institutions (D.1.) .....		3	
PE 250 Health Education (E.2.) .....		2	
REC 260 Intramural/Recreational Sports .....	3		
PE 280 First Aid and CPR.....			3
STAT 211 Elementary Probability and Statistics (B.2.) .....	3		
STAT 212 Statistical Methods.....		3	
POLS 210 American and California Government (D.1.) .....			3
PSY 201/PSY 202 General Psychology (E.1.).....			3
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....			3
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....	3		
Electives and courses to complete concentration .....	4		2
	16	16	17

**318 Physical Education and Recreation Administration**

<b>Junior</b>	<b>F</b>	<b>W</b>	<b>S</b>
REC 301 Outdoor Recreation Education .....	3		
REC 310 Program Administration in Leisure Services.....		3	
REC 323 Supervisory Roles in Recreation Administration .....		3	
REC 324 Organizational Patterns of Recreation Administration ....			3
REC 337 Implementation of Outdoor Recreation Programs .....			3
REC 364 Commercial Recreation and Leisure Services .....		3	
SOC 333 Social Research Methods.....			3
OH 337 Park Planning and Management or NRM 417 Resource Recreation Planning .....	4		
<sup>2</sup> Critical reading elective (C.1.) .....	3		
JOUR 312 Introduction to Public Relations .....	3		
HIST 315 Modern World History (D.2.).....		3	
ECON 201/ECON 211 (D.3.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.).....		3	
Electives and courses to complete concentration .....	<u>4</u>	<u>2</u>	<u>3</u>
	17	17	18
<b>Senior</b>			
REC 369 Research in Recreation Administration.....	3		
REC 424 Management of Recreation and Leisure Services .....			3
<sup>3</sup> REC 430, REC 431 Directed Field Experience .....	3		3
REC 457 Leisure Counseling .....			3
REC 461, REC 462 Senior Project .....		3	2
<sup>2</sup> Technology elective (F.2.) .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....	3		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
Electives and courses to complete concentration .....	<u>7</u>	<u>6</u>	<u>6</u>
	16	15	17

<sup>1</sup> Therapeutic Recreation students take ZOO 131 (4) as a concentration requirement.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>3</sup> 6 units of REC 432 may be substituted for REC 430, REC 431 if prerequisites are met.

## MASTER OF SCIENCE DEGREE IN PHYSICAL EDUCATION

### General Characteristics

The degree program is designed primarily to offer advanced study in physical education which will qualify men and women to enter the field at occupational levels requiring a master's degree. The program offers the increased depth and quality needed for (a) teaching physical education at the secondary and community college levels, (b) positions in private, governmental, and international agencies and programs, (c) self-directed study and growth in the field of physical education, or (d) continued graduate work at other institutions.

### Areas of Emphasis

Students may select one of the following areas of emphasis which is most compatible with career and personal objectives.

#### *Wellness Management*

Wellness Management is an extension of the Commercial/Corporate Fitness Option under the B.S. degree program in Physical Education. This emphasis will prepare people to: a) seek employment as a fitness/wellness program director in a variety of public and private agencies and companies, b) enter into their own business in this rapidly expanding field, and c) continue in an advanced degree program in health education, exercise science, and exercise physiology.

#### *Human Movement and Sport*

This emphasis is offered for students who wish advanced preparation for elementary, secondary, or college positions in physical education, or in related areas such as athletic administration and coaching. It is oriented toward a practical application and offers an opportunity for the in-depth study needed for: a) teaching physical education at all levels; b) coaching at the secondary and post-secondary levels, as well as with private and municipal agencies; c) program administration at all levels; and d) continued graduate work at other institutions.

### Prerequisites

#### **Conditionally Classified Standing**

The student may enroll in a graduate degree curriculum if in the opinion of the appropriate campus authority the student can remedy any deficiencies by additional preparation.

Those applicants with undergraduate deficiencies must remove these deficiencies before advancement to classified standing or advancement to candidacy. Undergraduate preparation should include a major in physical education or equivalent academic preparation as determined by the student's adviser. In addition, the student should have an adequate background in both activity and coaching theory classes as well as the following academic course work: human anatomy, human physiology, physiology of exercise, kinesiology, tests and measurements, organization and administration of physical education, adapted physical education, and curriculum and methods in physical education. These deficiencies may be removed by either course work or examination. Classes completed to remove deficiencies may not apply toward the master's degree.

#### **Classified Standing**

For admission to classified standing, an applicant must have an undergraduate major in physical education or equivalent academic preparation as determined by the departmental coordinator of graduate studies and a minimum grade point average of 2.5 in the last two years of undergraduate work.

#### **Advancement to Candidacy**

For advancement to candidacy a student shall complete 12 quarter units of 500 level classes on a formal program of study with a minimum grade point average of 3.0 at Cal Poly. At least 18 units must be completed after advancement to candidacy.

Requirements for the Degree

The formal program of study must include 45 units of approved graduate work; at least 30 of these units must be completed at the 500 level, with 24 of these units taken in Physical Education.

All candidates must meet the current Graduation Writing Requirement (see page 119).

Each candidate must successfully complete a comprehensive examination before the degree is granted. This examination may take one of two forms: (1) those students presenting a thesis must successfully defend the thesis in an oral examination, or (2) those students not presenting a thesis must pass an oral examination dealing with general current knowledge of the profession and course work taken toward the degree requirements.

If the degree is not completed within 4 years, the graduate faculty will require that a thesis candidate also be tested on course work.

Up to 12 units may be taken in 400-level PE courses with adviser approval provided those courses were not taken as part of the student's undergraduate program.

A maximum of 21 units may be taken outside of the Physical Education Department in 400- and 500-level courses. If all 21 units are elected outside of the PE department, 6 units must be at the 500 level.

CURRICULUM FOR THE MASTER OF SCIENCE DEGREE  
IN PHYSICAL EDUCATION

	Units
Required courses.....	9
PE 517 Research Methods in Physical Education (3)	
PE 513 Evaluation of Current Studies (3)	
PE 502 Current Trends and Issues in Physical Education (3)	
Area of Emphasis .....	18
Nine units must be selected from one of the following areas of emphasis.	
An additional 9 units must be taken in the area of emphasis with adviser approval.	
<i>Wellness Management</i>	
PE 503 Seminar in Adult Wellness (3)	
PE 512 Critical Health Issues (3-9)	
PE 530 Advanced Physiology of Exercise (3)	
PE 536 Electrocardiography (3)	
<i>Human Movement and Sport</i>	
PE 501 Administration of Adapted Physical Education Programs (3)	
PE 511 Administration of Physical Education and Athletics (3)	
PE 525 Human Performance and Learning (3)	
PE 526 Sport in American Society (3)	
Electives to be selected with adviser's approval .....	18
	45
For more detailed information or advisement, students should communicate with the Coordinator of Graduate Studies for Physical Education.	
See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Physical Education, Recreation Administration and other subjects.	

## PSYCHOLOGY AND HUMAN DEVELOPMENT DEPARTMENT

### Faculty

#### Department Head, Basil A. Fiorito

Robert L. Blodget  
Robert A. Christenson  
William D. Curtis  
Patricia Engle  
David L. Englund  
M. Dale Federer

Daniel Hawthorne  
Elaine Holder  
Ann Morgan  
Linden L. Nelson  
Kathleen A. Ryan

Ned W. Schultz  
Charles M. Slem  
Josephine S. Stearns  
W. Fred Stultz  
Bette W. Tryon

### Programs

B.S. Child and Family Development with Options in:

Applied Developmental

Psychology

Minor: Psychology

Early Childhood Education

Family Studies

The Psychology and Human Development Department consists of faculty with degrees in Psychology, Family Studies, Human Development and Education who direct a program leading to a B.S. degree in Child and Family Development and a minor in Psychology, as well as a broad range of support courses which serve the entire university community.

Child and Family Development majors complete a core of course work which provides them with a foundation in life-span human development and basic psychological principles as preparation for work with children and adults. In this core program, students participate in department operated infant, toddler, pre-school and elementary school-age laboratories and complete internships in area schools and human services agencies as part of the "learning by doing" educational process. Students select a curricular option in Early Childhood Education, Family Studies or Applied Developmental Psychology.

In addition to the B.S. degree in Child and Family Development, the department offers a minor in Psychology. The minor provides students with a broad background in the principles of psychology that develop an appreciation of the human element in the world around them, complement their professional training, and enhance their personal development and interpersonal effectiveness. Students whose primary job responsibilities will require dealing with people should find employment opportunities increased and career advancement enhanced.

The Psychology and Human Development Department's other main concerns are to provide courses which fulfill general education requirements, support other degree programs and serve as a personal development resource for all university students. These course offerings are designed to acquaint students with the facts, theories and contemporary trends in psychology and human development with a special emphasis on how these principles can be incorporated into a more coherent and meaningful understanding of oneself and of one's interactions with others.

**CURRICULAR OPTIONS****Applied Developmental Psychology**

This option is designed to prepare students for careers in human service agencies, health care settings, special needs programs, educational institutions and private or government organizations where practical aspects of human development are addressed. Students who choose this option study the nature of human development throughout the lifespan and learn to use psychological and developmental principles to assess and analyze behavior, to understand interpersonal relationships, and to implement behavior change and intervention techniques.

**Early Childhood Education**

Students selecting this option prepare for careers in preschool teaching, caregiving, and administrative positions with public or private institutions or for graduate work leading to college or university teaching and research positions. These graduates may plan for careers in programs that serve infants, preschool and school-age children. Students may also pursue course work leading to the Multiple Subjects Credential program for public elementary school teachers.

**Family Studies Option**

This option is an interdisciplinary program designed to provide the knowledge and experience necessary for a variety of careers in family, social service and counseling-related agencies in the public and private sectors. The Family Studies option is particularly appropriate for students who wish to work in educational or helping agencies and who desire a family developmental focus rather than a broad social science perspective at the undergraduate level. Many students in this option will pursue further graduate-level training in a variety of specializations.

**CURRICULUM IN CHILD AND FAMILY DEVELOPMENT**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
HD 101 Orientation to Psychology and Human Development ....	1		
HD 108 Introduction to Human Development .....			3
ETHS 114 Racism in American Culture or			
ETHS 210 Cultural Heritage .....		3	
HD 130 Beginning Study of Human and Family Development ....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
ENGL 114 Writing: Exposition (A.1.) .....	4		
<sup>1</sup> ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
<sup>1</sup> Physical science (with laboratory) elective or			
<sup>2</sup> PSC 101 The Physical Environment: Matter and Energy			
(B.1.a.) .....			4
<sup>1</sup> Life Science elective or			
<sup>3</sup> BIO 127 Natural History: Animal Adaptations (B.1.b.) .....	3		
<sup>1</sup> MATH 114 College Algebra (B.2.) .....		3	
<sup>1</sup> Fine and performing arts elective or			
<sup>2</sup> ART 112 Survey of Western Art (C.2.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ...			3
<sup>3</sup> Electives .....	2	1	3
	16	16	17

Sophomore	F	W	S
HD 203 Family Development .....	3		
HD 296 Infant and Toddler Development .....	3		
HD 298 Preschool and Middle Childhood Development .....		3	
HD 306 Adolescence .....			3
HD 230 Intermediate Study of Human and Family Development .....			3
HD 231 Seminar in Study of Human and Family Development....			1
STAT 211 Elementary Probability and Statistics or			
<sup>2</sup> MATH 327 Modern Elementary Mathematics (B.2.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
<sup>2</sup> DFA/HE 210 Nutrition or			
<sup>4</sup> PSY 304 Physiological Psychology (E.2.) .....			3
<sup>1</sup> Literature, philosophy, arts elective (300-400 Level) (C.3.) .....	3		
<sup>2</sup> PSC 102 The Physical Environment: Atoms and Molecules or			
<sup>1</sup> MATH/STAT/physical or life science elective (B.1 or B.2.)		4-3	
<sup>1</sup> Computer literacy elective (F.1.) .....			3
<sup>3</sup> Electives, support courses and courses to complete major option ..	2	3-4	4
	17	16	17
Junior			
HD 323 The Helping Relationship .....		3	
HD 308 Adulthood and Aging.....	3		
ECON 201/ECON 211/ECON 222 (D.3.) .....		3	
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
HIST 315 Modern World History (D.2.).....	3		
<sup>2</sup> BIO 129 Natural History: Plant Communities or			
BIO 302 Human Genetics (B.1.b.) .....		3	
<sup>1</sup> Critical reading elective (C.1.) .....			3
PSY 307 Abnormal Psychology .....	3		
HD 329 Research Methods in Psychology and Human			
Development .....			3
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....		3	
<sup>1</sup> Technology elective (F.2.) .....			3
<sup>3</sup> Support courses and courses to complete major option .....	5	4	7
	17	16	16
Senior			
HD 413 Parent-Child Relationships.....	3		
HD 461, HD 462 Senior Project .....	2	3	
<sup>2</sup> HD 330 Supervised Internship or			
HD/PSY 453 Supervised Field Work .....		6	
HD 463 Undergraduate Seminar.....			2
PSY 452 Personality.....		3	
<sup>1</sup> Critical reading elective (C.1.) .....	3		
PSY 402 Social Psychology .....	3		
PSY 458 Learning and Memory.....			3
<sup>2</sup> HD 430 Advanced Internship or			
HD/PSY 454 Supervised Field Work.....			6
<sup>3</sup> Support courses and courses to complete major option .....	6	5	5
	17	17	16

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> Early Childhood Education Option

<sup>3</sup> Of the total electives, 6 units for Family Studies and 3 units for Applied Developmental Psychology shall be chosen with the approval of the student's adviser.

<sup>4</sup> Family Studies Option

**APPLIED DEVELOPMENTAL PSYCHOLOGY OPTION**

(Add courses below to basic curriculum)

**Sophomore**

PSY 305 Human Sexuality ..... (2)

PSY 301 Psychology of Personal  
Development or PSY 309  
Psychology of Consciousness ..... (3)DFA 210 Nutrition or DFA 310  
Maternal and Child Nutrition ..... (3)**Junior**

PSY 302 Behavior in Organizations ..... (3)

PSY 317 Psychology of Stress ..... (3)

PSY 432 Psychological Testing ..... (3)

ANT 341/GEOG 215/SOC 323 ..... (3)

**Senior**

HD 421 Developmental Processes ..... (3)

HD 451 Family Crises ..... (3)

PSY 456 Behavioral Disorders in  
Children ..... (3)

PSY 459 Life Span Development ..... (3)

**EARLY CHILDHOOD EDUCATION OPTION**

(Add courses below to basic curriculum)

**Sophomore**HD 229 Program Planning for Young  
Children ..... (2)

ART 104 Introduction to Art Materials .. (3)

MU 100 Music Fundamentals–Applied .. (3)

**Junior**

ENGL 260 Children's Literature ..... (3)

MU 301 Music for Children ..... (3)

PE 280 First Aid and CPR ..... (3)

PSC 103 The Physical Environment:  
Earth and the Universe..... (4)

TH 380 Children's Drama ..... (3)

**Senior**HD 401 Foundations of Child  
Development ..... (3)HD 404 Administration of Child  
Development Centers ..... (3)

HD 421 Developmental Processes..... (3)

DFA/HE 310 Maternal and Child  
Nutrition ..... (3)**FAMILY STUDIES OPTION**

(Add courses below to basic curriculum)

**Sophomore**HE 203 Consumer Role of the Family  
or HE 207 Problems of Family  
Housing ..... (3)

PE 280 First Aid and CPR ..... (3)

**Junior**

HD 303 Family Interaction ..... (3)

HIST 325 Comparative History of  
American Minorities or SOC 377  
Health, Culture and Society..... (3)MGT 314 Human Resources Mgmt. or  
PSY 302 Behavior in Organizations .. (3)

PE 305 Drug Education ..... (2)

PSY 305 Human Sexuality ..... (2)

**Senior**

HD 450 Family Therapy ..... (3)

HD 451 Family Crises ..... (3)

HD 464 Issues in Family Life Education (3)

HD 481 Family Theory ..... (3)



## PSYCHOLOGY MINOR

The minor in Psychology consists of 27 units, 12 of which fulfill General Education and Breadth requirements. Eighteen of the 27 units are specified, with the remaining 9 units chosen from an approved list in consultation with the minor adviser. Interested students are encouraged to contact the Psychology and Human Development Department for information and application forms.

Required courses..... 18

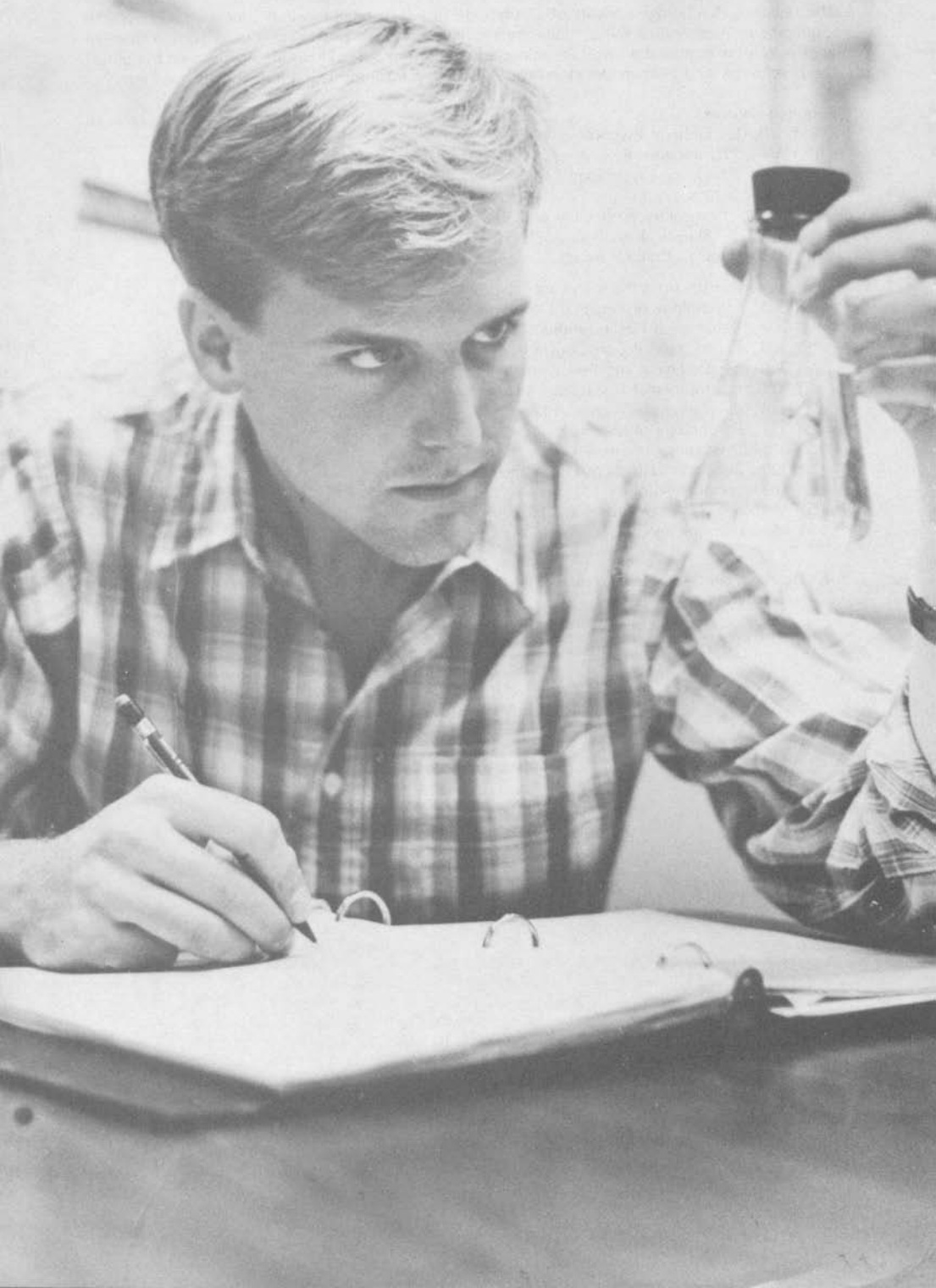
- PSY 201202 General Psychology (GEB E.1.) (3)
- PSY 304 Physiological Psychology (GEB E.2.) (3)
- PSY 307 Abnormal Psychology (3)
- PSY 452 Personality (3)
- STAT 211 Elementary Probability and Statistics (GEB B.2.) or
- STAT 321 Statistical Analysis (GEB B.2.) (3)
- ANT 360 Human Cultural Adaptation (GEB D.4.b) (3)

Select three courses from the following list: ..... 9

- PSY 301 Psychology of Personal Development (3)
- PSY 302 Behavior in Organizations (3)
- PSY 309 Psychology of Consciousness (3)
- PSY 310 Death, Dying and Bereavement (3)
- PSY 311 Environmental Psychology (3)
- PSY 314 Psychology of Women (3)
- PSY 315 Psychology of Men (3)
- PSY 317 Psychology of Stress (3)
- PSY 320 Behavioral Effects of Drugs and Alcohol (3)
- PSY 402 Social Psychology (3)
- PSY 456 Behavioral Disorders in Children (3)
- PSY 458 Learning and Memory (3)

27

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Human Development, Psychology and other subjects.



# School of Science and Mathematics

## DEGREE PROGRAMS

B.S. Biochemistry .....	340
B.S. Biological Sciences .....	330
Anatomy-Physiology Concentration	
Biology Concentration	
Marine Biology Concentration	
Plant Pathology-Entomology Concentration	
Plant Tissue Culture Technology Concentration	
B.S. Chemistry .....	338
B.S. Environmental and Systematic Biology.....	332
Ecology Concentration	
Fisheries and Wildlife Concentration	
Systematics Concentration	
B.S. Mathematics.....	342
Applied Mathematics Option	
Finite Mathematics Option	
Mathematics Teaching Option	
B.S. Microbiology .....	334
General Microbiology Option	
Medical Laboratory Technology Option	
B.S. Physical Science .....	349
B.S. Physics .....	347
B.S. Statistics .....	351
M.S. Biological Sciences.....	336
M.S. Chemistry .....	341
M.S. Mathematics .....	345
Applied Mathematics Specialization	
Mathematics Teaching Specialization	

# SCHOOL OF SCIENCE AND MATHEMATICS

Philip S. Bailey, Dean

Harry L. Fierstine, Associate Dean

The School of Science and Mathematics is composed of five departments: Biological Sciences, Chemistry, Mathematics, Physics, and Statistics and offers nine undergraduate programs leading to Bachelor of Science degrees in Biochemistry, Biological Sciences, Chemistry, Environmental and Systematic Biology, Mathematics, Microbiology, Physical Sciences, Physics, and Statistics and three graduate programs leading to Master of Science degrees in Biological Sciences, Chemistry and Mathematics. In cooperation with the School of Professional Studies and Education the school offers programs leading to teaching credentials in Biological Sciences, Mathematics, and Physical Sciences.

The School of Science and Mathematics has two equally important roles: (1) to provide support and breadth courses in science and mathematics for all students within the university and (2) to provide specialized coursework for students enrolled in one of the school's nine undergraduate and three graduate programs.

The school is, as is all of Cal Poly, dedicated to undergraduate instruction. Resources are channeled for this purpose in support of the "learn by doing" approach of this university. In laboratory, students have direct access to modern instrumentation. Classroom instruction is done in relatively small classes so that a personal approach by instructors is possible. Because of its large role in offering support courses to the rest of the university, the number of faculty in each department is relatively large and favors student-faculty interaction, both academically and socially.

## STUDENT SERVICES

The School Office not only assists the faculty and staff with the administration of the five instructional departments, but it acts on various student-initiated petitions (change of major, curriculum substitutions, withdrawal from the university). In addition, the Dean's Office has the dual function of counseling those on academic probation and notifying those undergraduate students who are eligible each quarter for the Dean's Honor List (grade point average places them in top 15 percent of students in the school).

## FACULTY ADVISING

Faculty members take an active role in academic and career advising. Students are encouraged by all and required by some departments to obtain academic advising prior to registration each quarter. The adviser-student relationship becomes important especially when the student needs a letter of reference for a potential employer or needs career advice. An advising center is available to students majoring in the Biological Sciences Department and the Chemistry Department.

## APPLYING TO GRADUATE SCHOOL

Many universities around the country offer fine masters and/or Ph.D. programs in the physical, biological and mathematical sciences. Faculty in the School of Science and Mathematics have earned master's and doctoral degrees from a wide variety of these universities and are excellent sources for information and advice about the graduate programs, prerequisites and application procedures. Applications to graduate programs should be made in the fall for admission to the following fall term. The Graduate Record Exam (GRE) should be taken early in the application cycle. Generally, two or more letters of reference from faculty are required. Most Ph.D. granting institutions offer financial support in the form of teaching assistantships and research fellowships.

## HEALTH SCIENCES PREPROFESSIONAL PREPARATION

Students applying to professional schools in the health sciences have need of current information in order to be competitive for admission. A Health Professions Guidance and Evaluation Committee has been established to assist students, regardless of their major, in all phases of their preparation. Please see page 52 of this catalog for more information.

## BIOLOGICAL SCIENCES DEPARTMENT

### Faculty

#### Department Head, V. L. Holland

Frederick P. Andoli  
Paraschos Babos  
James S. Booth  
Leslie S. Bowker  
Robert J. Brown  
Raul J. Cano  
Fred L. Clogston  
Jaime S. Colomé  
Alan F. Cooper  
Alvin A. DeJong  
Douglas D. Donaldson  
Harry L. Fierstine  
Dennis F. Frey  
Roger D. Gambs  
David V. Grady  
Constance H. Gray

Randolph L. Grayson  
John K. Hampton, Jr.  
Michael T. Hanson  
Dennis N. Homan  
C. Dennis Hynes  
Peter Jankay  
Eric V. Johnson  
David Keil  
Anthony E. Knable  
George N. Knecht  
Richard J. Krejsa  
A. Mark Kubinski  
Kingston L. Leong  
Malcolm G. McLeod  
Royden Nakamura  
Richard F. Nelson

Maria E. Ortiz  
Lee R. Parker  
Pratapsinha C. Pendse  
Elizabeth K. Perryman  
Thomas L. Richards  
Rhonda L. Riggins-Pimentel  
Aryan I. Roest  
Shirley R. Sparling  
William D. Stansfield  
John W. Thomas  
William Thurmond  
Dirk R. Walters  
Archie M. Waterbury  
Marvin J. Whalls  
Michael A. Yoshimura

### Programs

#### B.S. Biological Sciences

with Concentrations in:

Anatomy-Physiology

Biology

Marine Biology

Plant Pathology-Entomology

Plant Tissue Culture Technology

#### M.S. Biological Sciences

#### B.S. Environmental and Systematic

Biology with Concentrations in:

Ecology

Fisheries and Wildlife

Systematics

#### B.S. Microbiology with Options in:

General Microbiology

Medical Laboratory Technology

The department offers complete undergraduate programs leading to Bachelor of Science degrees in Biological Sciences, Environmental and Systematic Biology, and Microbiology. For qualified students, a graduate program is available leading to the Master of Science degree. In addition, a variety of courses is offered to satisfy biology requirements in other academic majors.

The department is housed in modern facilities equipped with up-to-date instrumentation. Cal Poly's geographical setting offers unusual opportunities for studying representative plants and animals of both Northern and Southern California. Graduates of the various programs enter fields in teaching; medical and biological laboratory technology; public health; wildlife management; agriculture; industry; and private, state and national park and forest services. A significant number enter graduate or professional schools for advanced study of botany, entomology, microbiology, plant pathology, zoology, marine sciences, veterinary science, medicine and dentistry. The department offers courses required for preprofessional training in medicine and paramedical fields. In the teaching area, all state requirements may be met for an academic major in biological sciences leading to credentials in secondary teaching.

**BIOLOGICAL SCIENCES MAJOR**

With the several curricular concentrations described below, this degree offers students a broad education in biology. It is suitable for preprofessional preparation in the bio-medical fields, as a base for work toward postbaccalaureate studies, and for technical competency in the concentrations offered. A list of courses for the various concentrations is available in the department office.

**Curricular Concentrations**

**Anatomy-Physiology**

This concentration is designed for students who are interested in zoology with an emphasis in the structure and function of animals. Preprofessional students of the health sciences would select this concentration.

**Biology**

This concentration gives the student a broad training in biology. Several of the courses in the concentration are required for the single subject teaching credential in biology.

**Marine Biology**

Students in this concentration may look forward to occupational and professional work in the field of oceanographic studies and enterprises.

**Plant Pathology-Entomology**

Students are trained to recognize, evaluate and solve plant disease and insect problems. They may be employed as technicians in research or extension service, or may continue their studies at the graduate level.

**Plant Tissue Culture Technology**

A program of study designed for the student who desires a career-oriented education leading to occupational and professional work in the field of botany and related subjects. Basic subject matter, skills, and laboratory experience in plant tissue culture and its applications are emphasized.

**CURRICULUM IN BIOLOGICAL SCIENCES**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
BOT 121, BOT 122    General Botany and			
BOT 123    Introductory Plant Taxonomy or			
ZOO 131, ZOO 132, ZOO 133    General Zoology    (B.1.b.) ..	4	4	4
CHEM 127, CHEM 128, CHEM 129    General Chemistry			
(B.1.a.) .....	4	4	4
CHEM 326    Survey of Organic Chemistry .....			4
ENGL 114    Writing: Exposition    (A.1.) .....		4	
ANT 201/GEOG 150/SOC 105 elective    (D.4.a.) .....	3		
ENGL 125/PHIL 125/SPC 125    Critical Thinking    (A.2.) .....			3
<sup>1</sup> ART/MU/TH elective    (C.2) .....		3	
<sup>2</sup> MATH 120    College Algebra and Trigonometry    (B.2.) .....	5		
	<hr/> 16	<hr/> 15	<hr/> 15

**Sophomore**

	F	W	S
ZOO 131, ZOO 132, ZOO 133 General Zoology or			
BOT 121, BOT 122 General Botany and			
BOT 123 Introductory Plant Taxonomy .....	4	4	4
BACT 221 General Bacteriology .....	4		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
PHYS 121, PHYS 122, PHYS 123 College Physics .....	4	4	4
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
ECON 201 Survey of Economics (D.3.) .....			3
DFA 210/PE 250/PSY 304 elective (E.2.) .....			2-3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
<sup>3</sup> Electives and courses to complete major .....			3-4
	16	17	17

**Junior**

<sup>4</sup> BIO 325 General Ecology .....			3
BIO 303 Genetics .....	3		
ENGL 302 Advanced Composition or			
ENGL 318 Writing for Scientific Journals .....			4
POLS 210 American and California Government (D.1.) .....	3		
<sup>5</sup> CSC 110 Computers and Computing (F.1.) .....		3	
<sup>1</sup> Critical reading electives (C.1.) .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....		3	
<sup>1</sup> Literature, philosophy, arts (300-400 level) elective (C.3.) .....		3	
BIO 461 Senior Project .....			3
<sup>4</sup> CHEM 328 Biochemistry (B.1.a.) .....	4		
<sup>4</sup> BIO 431 Physiology I: General .....		4	
LIB 301 Library Resources and Literature Searches .....		1	
<sup>3</sup> Electives and courses to complete major .....	4	3	4
	17	17	17

**Senior**

ENT 326 General Entomology .....	4		
BIO 462 Senior Project .....		2	
<sup>1</sup> Technology elective (F.2.) .....			3
BIO 423 General Cytology .....	4		
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
<sup>1</sup> Literature, philosophy, arts elective (C.3.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
<sup>3</sup> Electives and courses to complete major .....	6	9	11
	17	17	17

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> MATH 118 and MATH 119 or MATH 141 will substitute.

<sup>3</sup> Of the total elective units 18 shall be chosen in a field of concentration in the Biological Sciences with adviser approval and 2-3 units at 300-400 level of an approved Biological Sciences elective. Additional information is available from the department.

<sup>4</sup> BOT 326, BOT 322, CHEM 371 and CHEM 373 are recommended for students in Plant Tissue Culture Technology Concentration.

<sup>5</sup> CSC 101 or CSC 111 will substitute.

## ENVIRONMENTAL AND SYSTEMATIC BIOLOGY MAJOR

The four-year program in Environmental and Systematic Biology leads to a Bachelor of Science degree. Emphasis is placed on providing the student with an education in the variety of living organisms and their relationships to each other and to their environment. The concentrations described below enable the student to tailor his or her curriculum towards specific career objectives.

### Curricular Concentrations

#### Ecology

This concentration stresses a broad understanding of the interactions of organisms with each other and with their environment. With this foundation, graduates may pursue careers in education, ecology, environmental impact analysis, environmental monitoring or management in either government agencies or private industries. Graduates will be academically prepared for professional certification as Associate Ecologist by the Ecological Society of America.

#### Fisheries and Wildlife

This concentration prepares students for advanced training or employment in public and private agencies concerned with the biology and management of fish and wildlife species. By judicious selection of electives and in consultation with the student's adviser, the student will be prepared to apply for professional certification as a Wildlife Biologist by the Wildlife Society or as a Fisheries Biologist by the American Fisheries Society.

#### Systematics

This concentration stresses the identification and classification of living organisms. Graduates may pursue employment in teaching, in environmental impact analysis, or in museums, herbaria, zoos and botanical gardens, or go on to advanced education in taxonomy and systematics.

## CURRICULUM IN ENVIRONMENTAL AND SYSTEMATIC BIOLOGY

Freshman	F	W	S
ZOO 131, ZOO 132, ZOO 133 General Zoology (B.1.b.) .....	4	4	4
<sup>1</sup> CHEM 121, CHEM 122 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry .....			4
ENGL 114 Writing: Exposition (A.1.) .....		4	
<sup>2</sup> MATH 120 College Algebra and Trigonometry (B.2.) .....	5		
STAT 211 Elementary Probability and Statistics (B.2.) .....		3	
STAT 212 Statistical Methods .....			3
<sup>3</sup> ART/MU/TH elective (C.2.) .....			3
SS 121 Introductory Soil Science (F.2.) .....	4		
<sup>4</sup> CSC 110 Computers and Computing (F.1.) .....			3
	17	15	17
<b>Sophomore</b>			
BOT 121, BOT 122 General Botany and			
BOT 123 Introductory Plant Taxonomy .....	4	4	4
BACT 221 General Bacteriology .....			4
<sup>5</sup> PHYS 104 Introductory Physics (B.1.a.) .....	4		
GEOL 201 Physical Geology .....		3	
PHIL 125 Critical Thinking (A.2.) .....	3		
ECON 201/ECON 211/ECON 222 (D.3.) .....	3		
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
BIO 325 General Ecology .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>6</sup> Electives and courses to complete major .....	3		4
	17	17	15



	F	W	S
<b>Junior</b>			
BIO 303 Genetics .....	3		
BIO 315 Evolution .....		3	
BIO 442 Biometry .....	4		
ENGL 318 Writing for Scientific Journals .....			4
<sup>7</sup> ENT 326 General Entomology .....	4		
<sup>8</sup> BOT 333 Field Botany .....			4
BIO 461 Senior Project .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>3</sup> Critical reading elective (C.1.) .....		3	
<sup>5</sup> Electives and courses to complete major .....		3	3
	17	15	17
<b>Senior</b>			
BIO 431 Physiology I: General .....	4		
ZOO 437 Animal Behavior .....	4		
<sup>3</sup> Critical reading elective (C.1.) .....			3
<sup>3</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>3</sup> Literature, philosophy, arts (300-400 level) electives (C.3.) .....		3	3
PSY 304 Physiological Psychology (E.2.) .....			3
<sup>5</sup> Electives and courses to complete major .....	9	10	8
	17	16	17

<sup>1</sup> CHEM 127, CHEM 128, CHEM 129 and CHEM 328 are recommended for students planning postgraduate training.

<sup>2</sup> MATH 118 and MATH 119 or MATH 141 will substitute.

<sup>3</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>4</sup> CSC 111 will substitute.

<sup>5</sup> PHYS 121, PHYS 122, PHYS 123 are recommended substitutes for students planning postgraduate training.

<sup>6</sup> Of the total elective units, 20–26 must be selected from one of the concentrations with adviser approval.

<sup>7</sup> ZOO 336 recommended for students in Fisheries and Wildlife concentration.

<sup>8</sup> BOT 337 recommended for students in Fisheries and Wildlife concentration.

MICROBIOLOGY MAJOR

The undergraduate program leading to the Bachelor of Science degree in Microbiology involves the study of microorganisms such as bacteria, viruses, algae, protozoa, and fungi. Special emphases are placed on their structure and function as well as their interactions with each other and with human beings.

Curricular Options

General Microbiology

This option provides students with basic concepts in microbiology along with practical skills. Graduates are prepared to enter positions in industry, various areas of research, public health, teaching, and advanced degree programs.

Medical Laboratory Technology

This option prepares students specifically for careers in medically oriented fields: immunology, medical bacteriology, medical mycology, virology, parasitology, hematology, and genetics.

CURRICULUM IN MICROBIOLOGY

Freshman	F	W	S
ZOO 131, ZOO 132 General Zoology or			
BOT 121, BOT 122 General Botany (B.1.b.) .....	4	4	
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) .....	4	4	4
<sup>1</sup> MATH 118 Pre-Calculus Algebra (B.2.) .....		4	
MATH 119 Pre-Calculus Trigonometry or			
STAT 211 Elementary Probability and Statistics (B.2.) .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
ENGL 114 Writing: Exposition (A.1.) .....	4		
POLS 210 American and California Government (D.1.) .....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....			3
CSC 110 Computers and Computing (F.1.) .....			3
	15	15	16
Sophomore			
BOT 121, BOT 122 General Botany or			
ZOO 131, ZOO 132 General Zoology (B.1.b.) .....		4	4
<sup>3</sup> CHEM 326 Survey of Organic Chemistry .....	4		
BACT 224, BACT 225 General Microbiology .....	4		4
PHYS 121, PHYS 122, PHYS 123 College Physics .....	4	4	4
<sup>2</sup> Critical reading elective (C.1.) .....			3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
ECON 201 Survey of Economics or			
ECON 211 Principles of Economics (D.3.) .....		3	
Electives and courses to complete major .....		4	2
	16	15	17
Junior			
CHEM 331 Quantitative Analysis .....	5		
<sup>4</sup> CHEM 371 General Biochemistry (B.1.a.) .....	4		
BIO 303 Genetics .....		3	
BIO 431 Physiology I: General .....		4	
BACT 402 General Virology .....			3
<sup>2</sup> Literature, philosophy, arts (300-400 level) elective (C.3.) .....		3	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	

	F	W	S
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....	3		
HIST 315 Modern World History (D.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
Electives and courses to complete major .....	5	4	2
	17	17	17

#### Senior

ZOO 426 Serology and Immunology .....	4		
BACT 423 Medical Microbiology .....		4	
BACT 424 Bacterial Cytology and Physiology .....			4
BIO 304 Molecular Genetics .....	3		
BIO 461 Senior Project .....	3		
<sup>2</sup> Critical reading elective (C.1.) .....			3
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....		3	
<sup>2</sup> Technology elective (F.2.) .....		3	
DFA 210/PE 250/PSY 304 elective (E.2.) .....			2-3
Electives and courses to complete major .....	8	7	7-8
	18	17	17

<sup>1</sup> MATH 120 and STAT 211 or MATH 141 and STAT 211 will substitute.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>3</sup> CHEM 316 and CHEM 317 will substitute for CHEM 326. (Substitution strongly recommended for students in the General Microbiology Option.)

<sup>4</sup> CHEM 328 may be substituted for Medical Laboratory Technology Option only.

### GENERAL MICROBIOLOGY OPTION

(Add Courses Below to Microbiology Curriculum)

#### Junior and Senior Years

BACT 333 Industrial Microbiology .....	(4)	CHEM 372 General Biochemistry II .....	(3)
BACT 342 Sanitary Microbiology .....	(4)	CHEM 373 General Biochemistry III .....	(3)
BACT 421 Food Microbiology .....	(4)	CHEM 374 Biochemistry Laboratory .....	(2)
BACT 436 Microbial Ecology .....	(4)	BACT 403 General Virology Lab or	
BIO 423 General Cytology .....	(4)	BIO 463 Undergraduate Seminar .....	(2)

### MEDICAL LABORATORY TECHNOLOGY OPTION

(Add Courses Below to Microbiology Curriculum)

#### Sophomore

BIO 321 Biological Instrumentation .....	(3)	CHEM 335, CHEM 336 Clinical Chemistry .....	(7)
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#### Junior and Senior Years

BACT 430 Medical Mycology .....	(4)	CHEM 377 Chemistry of Drugs and Poisons .....	(3)
BIO 255 Microtechnique (2) or		ZOO 412 Introduction to Clinical Pathology .....	(3)
BIO 462 Senior Project (2) or		ZOO 425 Parasitology .....	(4)
BACT 403 General Virology Lab (2) (2)		ZOO 428 Hematology .....	(4)

## MASTER OF SCIENCE DEGREE IN BIOLOGICAL SCIENCES

### General Characteristics

This degree offers a broad background in biological sciences. The program is designed to offer sufficient breadth and depth to strengthen the student's academic understanding and improve competence for (a) many types of biological work which require advanced training beyond the bachelor's degree, (b) employment in industry and civil service, (c) teaching biological sciences at the elementary, secondary and community college levels, (d) independent research in the field of specialization, or (e) continued graduate work at other institutions.

### Prerequisites

Admission as a conditionally classified or classified student in this program requires a minimum grade point average of 3.0 in the last 90 quarter units attempted and satisfactory scores on the Graduate Record Examination. Advancement to candidacy requires a satisfactory background in biology, and completion of 12 units of courses specified in an informal study plan with a minimum grade point average of 3.0.

Information pertaining to specific departmental requirements for admission to graduate standing—classified or graduate standing—conditionally classified may be obtained from the Chairman of the Graduate Committee of the Biological Sciences Department.

### Program of Study

The formal program of study for the degree must include 45 units of committee-approved graduate work, at least 30 units of which must be at the 500 level. At least 18 units of the formal program of study must be completed after the student has been advanced to candidacy. A grade point average of 3.0 or better is required in all courses taken as a graduate student. Two approaches to the M.S. degree in Biological Sciences are possible, one involving course work and a comprehensive final examination and the other involving course work and a thesis which includes an oral defense.

### CURRICULUM FOR THE MASTER OF SCIENCE DEGREE IN BIOLOGICAL SCIENCES

	Thesis Plan	Course Work Plan
BIO 501 Cellular Biology .....	3	3
BIO 502 Biology of Organisms .....	3	3
BIO 503 Population Biology.....	3	3
BIO 590 Seminar in Biology.....	3	3
BIO 599 Thesis, including oral defense of thesis.....	9	—
BIO 500 Individual Study, including written report .....	—	4
Comprehensive Exam .....	No	Yes
Electives from 500-level courses .....	9	14
Electives from 400- and 500-level courses .....	15	15
	45	45

All 45 units must be acceptable for graduate credit and in accordance with Graduate Guidelines of the Biological Sciences Department. For further information students should communicate with the head of the Biological Sciences Department or with the Chairperson of the Graduate Committee.

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Bacteriology, Biology, Botany, Conservation, Entomology, Zoology and other subjects.

## CHEMISTRY DEPARTMENT

### Faculty

#### Department Head, William Rife

Linda Atwood  
Christina A. Bailey  
Philip S. Bailey  
Albert C. Censullo  
Robert S. Cichowski  
Lee Charles Coombs  
Charles E. Dills  
Norman L. Eatough  
Leland S. Endres  
Thomas G. Frey

John W. F. Goers  
Jerome F. Houlis  
Ralph A. Jacobson  
Dane R. Jones  
James Y. Katekaru  
David L. Keeling  
Martin A. Kellerman  
John F. Marlier  
John C. Maxwell  
Neil J. Moir

Dennis R. Phillips  
Michael G. Silvestri  
Jan W. Simek  
Russell L. Tice  
Howard D. Walker  
James D. Westover  
Hewitt G. Wight  
David G. Williamson  
Max T. Wills  
Marshall S. Wright

### Programs

B.S. Biochemistry  
B.S. Chemistry

M.S. Chemistry

The Chemistry Department has two roles in the university. It provides professional training to chemistry and biochemistry majors who plan careers in the natural sciences and allied fields, and it provides instruction in the fundamentals of chemistry to majors in fields related to chemistry, such as biology, engineering, soil science, dietetics, animal science, agriculture, and others.

The Chemistry Department emphasizes professional training in programs leading to the Bachelor of Science degree in Chemistry, accredited by the American Chemical Society, the Bachelor of Science degree in Biochemistry, and the Master of Science degree in Chemistry. All undergraduate chemistry majors follow a core curriculum in general, organic, inorganic, analytical, and physical chemistry, and biochemistry. Advanced undergraduates choose electives from a large variety of advanced courses, special topics courses, and master's level courses; recent offerings have included Environmental Chemistry, Geochemistry, Nuclear Chemistry, Polymer Chemistry, Agricultural Chemicals, Chemistry of Ceramic Glazes, Industrial Catalysis, Food Analysis, Drugs and Poisons, Nutritional Biochemistry, and many others. A pillar of the undergraduate program is the Senior Project, an intensive research experience of individual student design; while Senior Projects are often in pure chemistry or biochemistry, many apply an interdisciplinary approach and involve professors from Physics, Biological Sciences, Art, Soil Science, Civil and Environmental Engineering, Human Development and Psychology, Home Economics, and other departments. For students seeking industrial chemical experience before graduation, the Chemistry Department offers an increasingly active cooperative education program.

Career opportunities for chemists are constantly increasing, not only in traditional areas like industrial research and production, product quality control, environmental analysis, pharmacy, clinical chemistry, and secondary education, but also in nontraditional fields like patent law, science journalism, market research, safety engineering, and library science. A major in chemistry prepares the student for these careers or for specialized study after the bachelor's degree.

**CURRICULUM IN CHEMISTRY**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) .....	4	4	4
CHEM 156 General Chemistry Laboratory .....			1
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
MATH 131, MATH 132, MATH 133 Technical Calculus or MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
BIO 220/DFA 210/PE 250/PSY 304 elective (E.2.) .....		2-4	
CSC 110 Computers and Computing (F.1.) .....			3
BIO 101/BOT 121/ZOO 131 elective (B.1.b.) .....		3-4	
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
Electives.....		1-4	
	15	17	15
<b>Sophomore</b>			
CHEM 331 Quantitative Analysis .....	5		
CHEM 316, CHEM 317, CHEM 318 Organic Chemistry .....	4	5	5
PHYS 131, PHYS 132, PHYS 133 General Physics (B.1.a.) .....	4	4	4
MATH 241, MATH 242 or STAT or CSC courses .....		4	4
CHEM 253 Chemical Literature .....		1	
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....		3	
	16	17	17
<b>Junior</b>			
<sup>1</sup> Approved Chemistry electives .....	3	4	
CHEM 305, CHEM 306, CHEM 307 Physical Chemistry .....	3	3	4
CHEM 355, CHEM 356 Physical Chemistry Laboratory .....	1	1	
<sup>2</sup> Physics elective (200-level and above) .....	3		
POLS 210 American and California Government (D.1.) .....			3
<sup>3</sup> Critical reading electives (C.1.) .....	3		3
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
<sup>3</sup> ART/MU/TH elective (C.2.) .....			3
<sup>3</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....	3		
CHEM 332 Quantitative Analysis .....		4	
<sup>1</sup> Approved Chemistry elective .....		2	
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3) .....		3	
	16	17	16

Senior	F	W	S
CHEM 439 Instrumental Analysis .....	5		
CHEM 461 Senior Project .....		2	
CHEM 481 Inorganic Chemistry .....		3	
CHEM 459 Undergraduate Seminar .....	2		
<sup>1</sup> Approved Chemistry electives .....	3	3	2
HIST 315 Modern World History (D.2.) .....		3	
<sup>3</sup> Technology elective (F.2.) .....			3
<sup>3</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....	3		
<sup>3</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....			3
Electives .....		3	3
	13	14	14

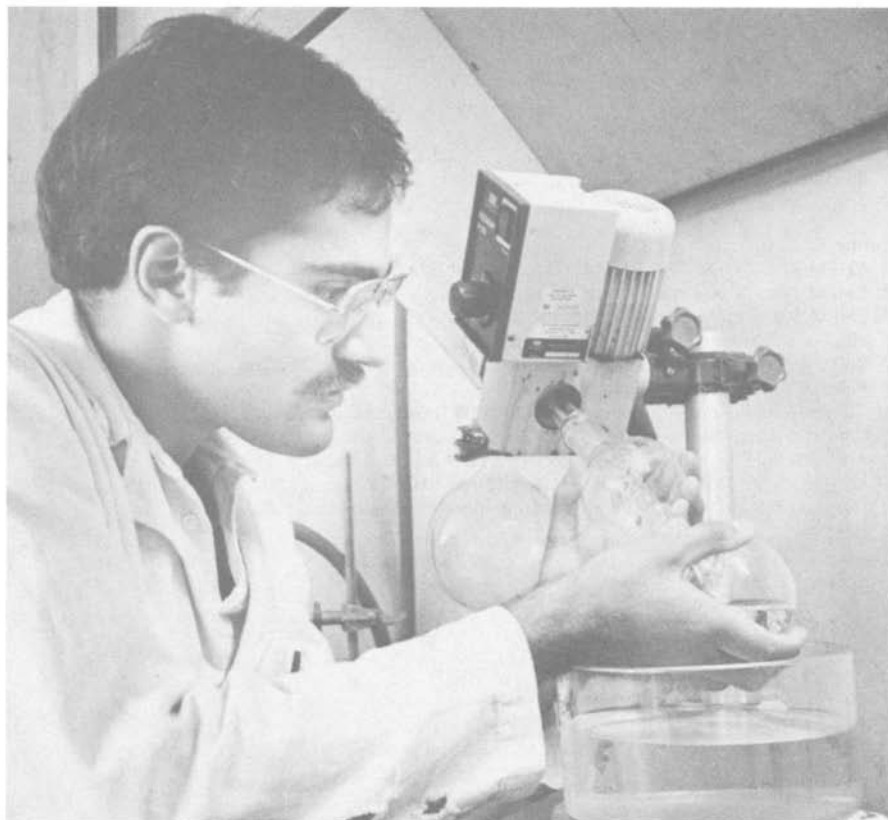
<sup>1</sup> To be chosen from the following, to include at least three courses from list "b".

a. CHEM 252, 335, 336, 341, 342, 344, 371, 372, 373, 374, 377, 378, 385, 400, 470, 471, COOP 360E (maximum of 4 units of COOP).

b. CHEM 405, 419, 444, 457, 458, 462, 482, 500-level courses.

<sup>2</sup> May not be PHYS 215.

<sup>3</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)



**CURRICULUM IN BIOCHEMISTRY**

<b>Freshman</b>	<b>F</b>	<b>W</b>	<b>S</b>
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) .....	4	4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....			3
MATH 131, MATH 132 Technical Calculus or MATH 141, MATH 142 Analytic Geometry and Calculus (B.2.) .....	4	4	
PHYS 121, PHYS 122 College Physics or PHYS 131, 132 General Physics (B.1.a.) .....		4	4
BOT 121 General Botany or ZOO 131 General Zoology or BACT 221 General Bacteriology (B.1.b.) .....		4	
<sup>1</sup> CSC 110 Computers and Computing (F.1.) .....			3
Electives .....	3		2
	15	16	16
<b>Sophomore</b>			
CHEM 331 Quantitative Analysis .....			5
CHEM 316, CHEM 317, CHEM 318 Organic Chemistry .....	4	5	5
PHYS 123 College Physics or PHYS 133 General Physics .....	4		
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....		4	
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....	3		
POLS 210 American and California Government (D.1.) .....			3
HIST 204 History of American Ideals and Institutions (D.1.) ....	3		
ECON 201 Survey of Economics or ECON 211 Principles of Economics (D.3.) .....		3	
<sup>2</sup> Life sciences elective (300-level recommended) (B.1.b.) .....		3	
CHEM 253 Chemical Literature .....		1	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
Elective .....	2		
	16	16	16
<b>Junior</b>			
CHEM 371, CHEM 372, CHEM 373 General Biochemistry .....	4	3	3
CHEM 374 Biochemistry Laboratory .....			2
<sup>3</sup> CHEM 301, CHEM 302 Biophysical Chemistry .....	3	4	
HIST 315 Modern World History (D.2.) .....	3		
BIO 220/DFA 210/PE 250/PSY 304 elective (E.2.) .....			2-4
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>2</sup> Literature, philosophy, arts electives (300-400 level) (C.3.) .....		6	
<sup>2</sup> Critical reading elective (C.1.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
Life sciences elective (300-level recommended) (B.1.b.) .....			3
Electives .....			0-2
	16	16	15



Senior	F	W	S
<sup>4</sup> Chemistry electives .....	3	3	3
CHEM 461 Senior Project .....		2	
CHEM 459 Undergraduate Seminar .....	2		
<sup>2</sup> Technology elective (F.2.) .....		3	
<sup>2</sup> Critical reading elective (C.1.) .....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
Electives .....	7	5	10
	15	16	13

<sup>1</sup> CSC 101 will substitute.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>3</sup> CHEM 305, CHEM 306, CHEM 355 will substitute.

<sup>4</sup> CHEM 156, CHEM 252, CHEM 300-, 400-, and 500-level courses (except CHEM 326 and CHEM 328), COOP 360E (maximum of 4 units of COOP).

## MASTER OF SCIENCE DEGREE IN CHEMISTRY

### General Characteristics

This program is designed to provide training at the graduate level for those who will be seeking employment in industry, government, and education, and for those who will be continuing their graduate or professional education at other institutions.

The hallmark of the program is flexibility. Students can choose to do a traditional research thesis, or choose either the extra course work or industrial internship non-thesis option. The internship program, which is one of the largest in the U.S., provides the student with a six-month, full-time, full-pay industrial position. The internship takes the place of the traditional research thesis. A limited number of graduate student assistant instructor positions are available. Applicants to all programs follow the same admissions procedures.

### Prerequisites

Admission to the program as a classified graduate student normally requires a baccalaureate degree in chemistry or biochemistry and a minimum grade point average of 3.0 in the last 90 quarter units of course work attempted. Applicants with majors in other areas may be admitted conditionally. More detailed information pertaining to specific departmental requirements may be obtained from the Departmental Graduate Coordinator or the head of the Chemistry Department.

Advancement to candidacy requires completion of any prerequisites or conditions, completion of 12 units of course work specified in the formal study plan with a minimum grade point average of 3.0, and, for thesis students, approval of the thesis proposal.

## CURRICULUM FOR THE MASTER OF SCIENCE DEGREE IN CHEMISTRY

Units

Required courses: ..... 27

500-level CHEM courses (18)

CHEM 590 Graduate Seminar (3)

CHEM 598 Internship (3-6) or

CHEM 599 Thesis (3) (3) or additional courses

if the course work option is chosen (6)

Additional courses at 400 or 500 level: ..... 18

Twelve units from the Chemistry Department and six units outside of the Chemistry Department

## MATHEMATICS DEPARTMENT

### Faculty

#### Department Head (Interim), Paul F. Murphy

Sabah Al-hadad  
 Alfred M. Bachman  
 Bernard W. Banks  
 Estelle L. Basor  
 Michael R. Colvin  
 H. Arthur DeKleine  
 James E. Delany  
 Gary M. Epstein  
 Gerald P. Farrell  
 Jack E. Girolo  
 D. Edward Glassco  
 Stuart Goldenberg  
 Harvey C. Greenwald  
 Thomas E. Hale  
 Adelaide T. Harmon-Elliott

Donald G. Hartig  
 Charles T. Haskell  
 Alan W. Holz  
 J. Myron Hood  
 Kempton L. Huehn  
 Rex L. Hutton  
 Boyd Walker Johnson  
 Goro C. Kato  
 Euel W. Kennedy  
 Martin T. Lang  
 George M. Lewis  
 John J. Lowry  
 George W. Luna  
 George R. Mach

Jean M. McDill  
 Kent E. Morrison  
 James R. Mueller  
 Thomas D. O'Neil  
 Don Rawlings  
 Howard Steinberg  
 H. Bernard Strickmeier  
 Raymond D. Terry  
 Neal R. Townsend  
 John Van Eps  
 Ralph M. Warten  
 Stephen T. Weinstein  
 Robert S. Wolf  
 Ahmed I. Zayed

### Programs

B.S. Mathematics  
 with Options in:  
 Applied Mathematics  
 Finite Mathematics  
 Mathematics Teaching

M.S. Mathematics  
 with Specializations in:  
 Applied Mathematics  
 Mathematics Teaching

The Mathematics Department offers a complete program of university work leading to a Bachelor of Science degree in Mathematics with options in Applied Mathematics, Finite Mathematics, and Mathematics Teaching. The department also offers Mathematics courses needed in all other curricula for developing vocational and professional proficiency and for general education. The occupational flavor generated by these close interdepartmental relations increases both the usefulness of and the demand for the graduates who complete one of the degrees in mathematics.

High school students planning a mathematics major should have at least three, and preferably four, years of high school mathematics, and two years of science.

A program of study which leads to a Master of Science degree in Mathematics with specializations in Mathematics Teaching and in Applied Mathematics is offered. A graduate in the mathematics teaching specialization of this program will be qualified for community college teaching positions or, with the proper credential, for teaching positions in secondary schools. A graduate in the applied mathematics specialization will be qualified for advanced positions in industry, business, civil service, college teaching, or other scientific endeavors.

### CURRICULAR OPTIONS

#### Applied Mathematics

This option is designed for students desiring a broad exposure to those fields of mathematics which have been, and continue to be, most useful to the development of physical sciences and engineering. This option will furnish the mathematics needed by a student who seeks to enter employment in

industry or government as a support mathematician for production, research, and development. In addition, this option will provide adequate mathematical foundation for the student contemplating the pursuit of an advanced degree in mathematics.

### Finite Mathematics

This option is designed for students in this rapidly growing branch of mathematics that has many applications in business and management sciences, resources allocation, and traffic flow. A student in computer science, industrial engineering, business, and in related fields will find many topics of interest in this option. Emphasis will be on mathematical model building and applications.

### Mathematics Teaching

The Mathematics Teaching Option is designed primarily to prepare the student for a teaching career in junior and senior high schools. With additional courses as prescribed by the Education Department, the student completing this option can obtain a California single subject teaching credential in mathematics. This option also provides the student with a desirable undergraduate foundation for the master of science degree in the mathematics teaching specialization, a degree appropriate for teaching service in community colleges and also appropriate for secondary school mathematics teachers.

## CURRICULUM IN MATHEMATICS

### Freshman

	F	W	S
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
MATH 170 Theory of Equations .....			2
CSC 101 Fortran Programming .....	2		
<sup>1</sup> PHYS 131, PHYS 132 Physics (B.1.a.) .....		4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
Electives and courses to complete major .....	6	6	6
	16	17	16

### Sophomore

MATH 241 Analytic Geometry and Calculus .....	4		
<sup>2</sup> MATH 242 Differential Equations .....		4	
MATH 248 Methods of Proof in Mathematics .....	3		
MATH 312 Linear Algebra .....		4	
STAT 321 Statistical Analysis .....			3
<sup>1</sup> PHYS 133 General Physics (B.1.a.) .....	4		
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
POLS 210 American and California Government (D.1.) .....	3		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....		3	
Electives and courses to complete major .....	3	3	11
	17	17	18

### Junior

MATH 381 Modern Algebra .....		4	
STAT 322 Statistical Analysis .....	3		
HIST 315 Modern World History (D.2.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....		3	
<sup>3</sup> Life sciences elective (B.1.b.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>3</sup> Critical reading electives (C.1.) .....		3	3
BIO 220/DFA 210/PE 250/PSY 304 elective (E.2.) .....			2
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
<sup>3</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>3</sup> Economics elective (D.3.) .....			3
Electives and courses to complete major .....	4	4	5
	16	17	16

**Senior**

	<b>F</b>	<b>W</b>	<b>S</b>
MATH 412 Advanced Calculus .....	4		
MATH 459 Undergraduate Seminar .....	2		
<sup>4</sup> MATH 461, MATH 462 Senior Project .....		3	2
<sup>3</sup> ART/MU/TH elective (C.2.) .....	3		
<sup>3</sup> Literature, philosophy, arts electives (3 units at 300-400 level) (C.3.) .....		3	3
<sup>3</sup> Technology elective (F.2.) .....		3	
Electives and courses to complete major .....	7	7	11
	16	16	16

**APPLIED MATHEMATICS OPTION****(Add Courses Below to Mathematics Curriculum)**

MATH 304 Vector Analysis .....	(4)	CSC 332, CSC 333 Numerical Analysis I, II .....	(6)
MATH 313 Linear Algebra .....	(4)	MATH 336 Combinatorial Mathematics .....	(3)
MATH 318 Advanced Engineering Mathematics .....	(4)	MATH 408 Functions of a Complex Variable .....	(4)
MATH 319 Partial Differential Equations .....	(4)	MATH 413 Advanced Calculus .....	(3)
CSC 221 Computer Principles and Programming (F.1.) .....	(4)		

**FINITE MATHEMATICS OPTION****(Add Courses Below to Mathematics Curriculum)**

MATH 313 Linear Algebra .....	(4)	MATH 437 Game Theory .....	(3)
MATH 318 Advanced Engineering Mathematics .....	(4)	CSC 219 Linear Programming .....	(3)
MATH 335 Graph Theory .....	(3)	CSC 221 Computer Principles and Programming (F.1.) .....	(4)
MATH 336 Combinatorial Mathematics .....	(3)	CSC 350 Discrete Dynamic Systems ....	(3)
MATH 431, MATH 432 Mathematical Optimization I, II .....	(6)	CSC 360 Continuous Dynamic Systems .....	(3)
		CSC 419 Mathematical Programming .....	(3)

**MATHEMATICS TEACHING OPTION****(Add Courses Below to Mathematics Curriculum)**

MATH 341 Theory of Numbers .....	(4)	<sup>5</sup> MATH 442, MATH 443, MATH 444 Euclidean and Modern Geometries .....	(9)
MATH 382 Modern Algebra .....	(4)	CSC 207 BASIC Programming.....	(3)
MATH 419 Introduction to History of Mathematics .....	(3)	<sup>6</sup> CSC 414 Computer Assisted Instruction (F.1.) .....	(3)
MATH 424 Organizing and Teaching Mathematics .....	(4)	<sup>7</sup> Electives .....	(3)

<sup>1</sup> Teaching option majors may substitute PHYS 121, PHYS 122, PHYS 123.<sup>2</sup> Teaching option majors may substitute 4 or more units from the following: MATH 300, MATH 313, MATH 335, MATH 336, MATH 413, MATH 414.<sup>3</sup> To be selected in accordance with General Education-Breadth requirements. (Please see page 98 of this catalog.)<sup>4</sup> Teaching option majors who complete ED 410 and ED 420 need only take MATH 462.<sup>5</sup> May substitute MATH 335 for MATH 444.<sup>6</sup> May replace CSC 414 with any of the following: CSC 201, CSC 221, CSC 255.<sup>7</sup> Selected from MATH 242, MATH 300, MATH 313, MATH 335, MATH 336, MATH 413, MATH 414.

# MASTER OF SCIENCE DEGREE IN MATHEMATICS

## General Characteristics

A graduate of this program with a specialization in Applied Mathematics will be prepared for employment as a mathematician in government or industry. A graduate of this program with a specialization in Mathematics Teaching will have satisfied the fifth year requirement for a secondary credential. Students who complete either specialization will be qualified for teaching in a community college and will be prepared to pursue further graduate study.

## Prerequisites

Prerequisite to entering the program with a classified or conditionally classified status, the student must have a bachelor's degree from an accredited institution with a minimum grade point average of 2.5 in the last 90 quarter units attempted. Advancement to candidacy requires approval of a formal program of study by the departmental graduate study committee and completion of 12 units of the courses specified in the informal study plan with a minimum grade point average of 3.0.

For information pertaining to specific departmental requirements for admission to graduate standing—classified or graduate standing—conditionally classified, the student should communicate with the head of the Mathematics Department.

## CURRICULUM FOR THE MASTER OF SCIENCE DEGREE IN MATHEMATICS

With a Specialization in Applied Mathematics or in Mathematics Teaching	Units
Required courses.....	12
MATH 506 Topics in Modern Algebra (4)	
MATH 508 Introduction in Topology (4)	
MATH 515 Real Analysis (4)	
Specialization courses.....	12
500-level courses selected according to specialization:	
For specialization in <i>Mathematics Teaching</i> : MATH 580 and 519 and 4 additional units selected from MATH 505, 507, 510, 580.	
For specialization in <i>Applied Mathematics</i> : MATH 512, 580 and 4 additional units selected from: MATH 513, 516, 518, 580.	
MATH, CSC, STAT electives .....	12
Select from any MATH, CSC, or STAT 400- or 500-level courses as approved by the advising committee.	
Electives .....	9
Select additional units according to specialization with approval of adviser.	
For specialization in Applied Mathematics, these units are to be selected in one area other than MATH, STAT, and CSC (physics, engineering, economics, chemistry, etc.). Exceptions may be made for candidates with an approved baccalaureate or higher degree in a field other than mathematics, computer science or statistics.	
Satisfactorily complete a terminal written and oral examination; or complete MATH 596, Graduate Thesis, for 6 units of credit toward the 12 units required in MATH, CSC or STAT.	

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## PHYSICS DEPARTMENT

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### Faculty

**Chairman, Leonard W. Wall**

Lawrence H. Balthaser  
Joseph C. Boone  
Ronald F. Brown  
Anthony J. Buffa  
Arthur S. Cary  
David H. Chipping  
Christopher deLatour  
Robert H. Dickerson  
Neil L. Fleishon

Theodore C. Foster  
Teymoor Gedayloo  
David W. Hafemeister  
Kenneth A. Hoffman  
James S. Kalathil  
John Mottmann  
Kenneth S. Ozawa  
Ralph A. Peters  
John E. Poling

David M. Roach  
Arthur Z. Rosen  
Richard A. Saenz  
Thomas G. Schumann  
Gordon A. Silver  
Keith S. Stowe  
Willem L. van Wyngaarden  
Walter D. Wilson

### Programs

**B.S. Physical Science**

**B.S. Physics**

The Physics Department offers curricula in physics and in physical sciences leading to the Bachelor of Science degree. It serves all schools of the university by offering courses which provide the scientific foundations for work taken by students in their major fields. The department also contributes to the general education of all students by increasing their understanding of the process of scientific discovery, of the nature of the physical universe, and of the potential impact of science on society.

The department's goal in training physics majors is to prepare them for entry into positions as physicists, to prepare them for further training as physics teachers, or to give them a strong foundation in science that will enable them to enter other related professions. The program also prepares students for possible further formal education in graduate school. Graduates are engaged in many fields and industries, including computers, electronics, aerospace, energy production and utilization, and the development of material resources and products. To prepare physics majors effectively for employment, the department provides a comprehensive laboratory program, with facilities which include specialized laboratories in electrical measurements, optics, solid state physics, nuclear physics, and atomic physics. Student activities include a chapter of the national Society of Physics Students and a chapter of the national physics honor society, Sigma Pi Sigma.

High school students planning to major in physics should include in their high school program as much as possible of the following: six semesters of college preparatory mathematics, two of physics and two of chemistry.

The Bachelor of Science in Physical Science is a degree major designed primarily to provide undergraduate preparation for the student who intends to be a secondary school teacher of one or more of the physical sciences. It may also serve students who plan to enter another field in which a physical science background would be useful, but students intending to do graduate study in either chemistry or physics should elect a chemistry or physics major. Students planning to qualify for a teaching credential in physical science should plan their electives to include the education courses indicated. The Physical Science degree program is administered jointly by the Chemistry and Physics Departments.

**CURRICULUM IN PHYSICS****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
<sup>1</sup> Life sciences elective (B.1.b.) .....	3		
ENGL 114 Writing: Exposition (A.1.) .....	4		
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PE 250 Health Education or			
PSY 304 Physiological Psychology (E.2.) .....		2	
MATH 141, MATH 142, MATH 143 Analytic Geometry and			
Calculus .....	4	4	4
CHEM 127, CHEM 128 General Chemistry (B.1.a.) .....	4	4	
CHEM 326 Survey of Organic Chemistry (B.1.a.) .....			4
PHYS 131, PHYS 132 General Physics .....		4	4
	<u>15</u>	<u>17</u>	<u>15</u>

**Sophomore**

ECON 201/ECON 211/ECON 222 (D.3.) .....			3
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 242 Differential Equations .....		4	
<sup>2</sup> Computer literacy elective (F.1.) .....	2		
MATH 318 Advanced Engineering Mathematics .....			4
PHYS 133 General Physics .....	4		
PHYS 211 Modern Physics .....		4	
PHYS 213 Introduction to Nuclear Physics .....			3
PHYS 243 Introductory Nuclear Physics Laboratory .....			1
PHYS 206, PHYS 207 Instrumentation in Experimental Physics ..		2	2
PHYS 256, PHYS 257 Electrical Measurements Laboratory .....		1	1
<sup>1</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....	3		
<sup>1</sup> Philosophy elective (C.3.) .....		3	
<sup>1</sup> ART/MU/TH elective (C.2.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....		3	
	<u>16</u>	<u>17</u>	<u>17</u>

**Junior**

<sup>1</sup> Critical reading electives (C.1.) .....	3		3
ENGL 215 Writing: Argumentation or			
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
MATH 319 Partial Differential Equations .....		4	
MATH 304 Vector Analysis (B.2.) .....	4		
PHYS 301 Thermal Physics I .....	3		
PHYS 302, PHYS 303 Analytic Mechanics .....	3	3	
PHYS 405 Quantum Mechanics .....	3		
PHYS 341, PHYS 342 Quantum Physics Laboratory .....	1	2	
PHYS 323 Optics .....		4	
PHYS 363 Undergraduate Seminar .....			2
PSY 201/PSY 202 General Psychology (E.1.) .....			3
<sup>3</sup> Approved PHYS electives .....		3	6
	<u>17</u>	<u>16</u>	<u>18</u>

Senior	F	W	S
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
<sup>1</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....	3		
PHYS 408, PHYS 409 Electromagnetic Fields and Waves .....	4	3	
PHYS 461, PHYS 462 Senior Project .....	2	2	
<sup>3</sup> Approved PHYS electives .....	3	3	3
<sup>1</sup> Technology elective (F.2.) .....			2
Electives .....		4	5
	15	15	13

<sup>1</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>2</sup> CSC 101, CSC 118, CSC 120 or any course requiring one of these courses as a prerequisite.

<sup>3</sup> Approved Physics electives include the following courses: PHYS 317, 401, 403, 406, 407, 410, 413, 416, 423, 444, 456, 470, 471. For students anticipating an industrial career PHYS 406, 456, 413, 423 are suggested electives. For students anticipating graduate work in Physics PHYS 407, 423, 444 are suggested electives.





**CURRICULUM IN PHYSICAL SCIENCE****Freshman**

	<b>F</b>	<b>W</b>	<b>S</b>
CHEM 127, CHEM 128, CHEM 129 General Chemistry (B.1.a.) .....	4	4	4
<sup>1</sup> PHYS 131, PHYS 132 General Physics or PHYS 121, PHYS 122 College Physics (B.1.a.) .....		4	4
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus or MATH 131, MATH 132, MATH 133 Technical Calculus (B.2.) .....	4	4	4
ENGL 114 Writing: Exposition (A.1.) .....	4		
<sup>2</sup> ART/MU/TH elective (C.2.) .....	3		
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
	<u>15</u>	<u>15</u>	<u>15</u>

**Sophomore**

<sup>1</sup> Chemistry electives (CHEM 326 or CHEM 316 and CHEM 328 or CHEM 371) .....	4		4
<sup>1</sup> Physics electives (PHYS 133 or PHYS 123 and PHYS 211 or PHYS 210) .....	4	4	
<sup>3</sup> Physics elective .....		3	
<sup>4</sup> MATH, CSC, or STAT electives .....		4	4
CSC 110 Computers and Computing or CSC 410 Computer Fundamentals for Educators (F.1.) .....	3		
GEOL 201 Physical Geology .....			3
POLS 210 American and California Government (D.1.) .....	3		
SPC 201 Public Speaking or SPC 202 Principles of Speech (A.3.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....		3	
HIST 315 Modern World History (D.2.) .....			3
BIO 220/DFA 210/PE 250/PSY 304 (E.2.) .....		2	
PSY 201/PSY 202 General Psychology (E.1.) .....			3
	<u>17</u>	<u>16</u>	<u>17</u>

**Junior**

CHEM 301 Biophysical Chemistry or CHEM 305 Physical Chemistry .....	3		
ASTR 301 The Solar System or ASTR 302 Stars and Galaxies .....	3		
<sup>2</sup> Life science elective (B.1.b.) .....	3		
<sup>3</sup> Chemistry elective .....		4	
<sup>3</sup> Astronomy and/or earth science elective .....			4
<sup>3</sup> Physical science 300-400 level electives .....		3	3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
ENGL 215 Writing: Argumentation or ENGL 218 Writing: Argumentation and Reports (A.4.) .....	4		
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
ECON 201/ECON 211/ECON 222 (D.3.) .....			3
<sup>5</sup> Electives .....		6	6
	<u>16</u>	<u>16</u>	<u>16</u>

Senior	F	W	S
CHEM 461, PHYS 461, or PSC 461 Senior Project .....	2		
<sup>3</sup> Approved Physical Sciences 300-400 level elective. Prospective teachers take PSC 424.) .....	3		
<sup>3</sup> Physics 300-400 level elective .....			3
<sup>2</sup> Critical reading electives (C.1.) .....		3	3
<sup>2</sup> Literature, philosophy, arts electives (300-400 level) (C.3.) .....			6
<sup>2</sup> Technology elective (F.2.) .....	3		
<sup>5</sup> Electives .....	8	11	4
	16	14	16

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Physics and Physical Science and other subjects.

<sup>1</sup> A choice of the PHYS 121, PHYS 122, PHYS 123 sequence or CHEM 326 or CHEM 328 restricts the Physics and Chemistry electives available to the student later in this program.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>3</sup> Chosen with approval of adviser.

<sup>4</sup> Must be at least 200 level.

<sup>5</sup> Students planning on qualifying for a teaching credential must take ED 302, ED 305, ED 403, ED 404, ED 405, ED 409, ED 410, ED 420.

## STATISTICS DEPARTMENT

### Faculty

**Department Head (Interim), James C. Daly**

Jay L. Devore

John E. Groves

Y. Leon Maksoudian

Roxy L. Peck

John M. Rogers

Robert K. Smidt

Kent D. Smith

Sing-Chou Wu

### Programs

#### B.S. Statistics

The Statistics Department, formerly part of the Computer Science and Statistics Department, has two primary purposes—to offer introductory statistics courses to students from many different majors at Cal Poly, and to offer a curriculum of diverse statistics courses for those students pursuing a Bachelor of Science degree in Statistics.

In this age of high technology it has become increasingly easy to record and store information resulting from experiments, surveys, and historical studies. It is the responsibility of the professional statistician to determine the best ways to collect, summarize and analyze these data. Because of the increasing number of quantitative studies that are conducted in fields ranging from medicine to agriculture to business, the professional statistician has become in great demand. The National Science Foundation estimates that statistics is one of the few areas that will have more openings in the late 1980's than there are individuals with degrees in that area. Recent graduates of the program at Cal Poly are working for companies in fields as diverse as insurance, weapons testing, aircraft manufacturing, banking, and computer manufacturing.

The statistics degree program requires students to have a substantial amount of course work in mathematics and computer science. With this basis the students take courses in the following statistics areas—analysis of variance, regression analysis, statistical use of computers, sampling methods, nonparametric analysis, multivariate analysis, and mathematical statistics. In the various courses the students make use of computer systems available at Cal Poly. Throughout the program faculty encourage students to work on practical, realistic problems that require the understanding of all aspects of the data acquisition and analysis problem.

### CURRICULUM IN STATISTICS

#### Freshman

	F	W	S
MATH 141, MATH 142, MATH 143 Analytic Geometry and Calculus (B.2.) .....	4	4	4
CSC 118 Fundamentals of Computer Science .....	4		
ENGL 114 Writing: Exposition (A.1.) .....	4		
ENGL 218 Writing: Argumentation and Reports (A.4.) .....			4
ENGL 125/PHIL 125/SPC 125 Critical Thinking (A.2.) .....		3	
PHYS 131 General Physics (B.1.a.) .....		4	
BIO 101 General Biology (B.1.b.) .....			3
PSY 201/PSY 202 General Psychology (E.1.) .....			3
<sup>1</sup> Electives .....	4	5	3
	16	16	17

<b>Sophomore</b>	<b>F</b>	<b>W</b>	<b>S</b>
MATH 241 Analytic Geometry and Calculus .....	4		
MATH 204 Mathematics of Matrices .....		3	
MATH 242 Differential Equations .....		4	
STAT 321, STAT 322 Statistical Analysis .....		3	3
MATH 248 Methods of Proof in Mathematics .....			3
CSC 201 Fortran Programming II.....	3		
ECON 211 Principles of Economics (D.3.) .....	3		
PHIL 230/PHIL 231 Philosophical Classics (C.1.) .....			3
SPC 201 Public Speaking or			
SPC 202 Principles of Speech (A.3.) .....			3
BIO 303 Genetics (B.1.b.) .....			3
ANT 201/GEOG 150/SOC 105 elective (D.4.a.) .....	3		
<sup>2</sup> ART/MU/TH elective (C.2.) .....		3	
<sup>1</sup> Electives .....	3	3	1
	16	16	16
<b>Junior</b>			
STAT 323 Analysis of Variance .....	3		
STAT 330 Statistical Uses of Computers .....		3	
STAT 324 Applied Regression Analysis .....			3
STAT 421 Sampling Techniques .....			3
CSC 332 Numerical Analysis I .....			3
<sup>2</sup> Critical reading electives (C.1.) .....	3	3	
CSC 219 Linear Programming (F.1.) .....		3	
<sup>3</sup> Approved MATH electives (300-400 level) .....	3	3	
BIO 220/DFA 210/PE 250/PSY 304 elective (E.2.) .....	2		
<sup>2</sup> Literature, philosophy, arts elective (C.3.) .....			3
POLS 210 American and California Government (D.1.) .....	3		
HIST 204 History of American Ideals and Institutions (D.1.) ....			3
<sup>1</sup> Electives .....	3	3	2
	17	15	17
<b>Senior</b>			
STAT 425 Probability Theory and Applications I .....	3		
STAT 426 Probability Theory and Applications II .....		3	
STAT 427 Mathematical Statistics .....			3
STAT 415 Nonparametric Methods in Statistics .....	3		
STAT 423 Linear Models .....		3	
STAT 418 Topics in Multivariate Statistics .....			3
STAT 461, STAT 462 Senior Project .....	2	2	
STAT 463 Undergraduate Seminar .....			2
<sup>2</sup> Technology elective (F.2.) .....		3	
CSC 350 Discrete Dynamic Systems .....	3		
HIST 315 Modern World History (D.2.) .....	3		
<sup>2</sup> Literature, philosophy, arts elective (300-400 level) (C.3.) .....			3
<sup>2</sup> ANT/BUS/ECON/GEOG/POLS/SOC elective (D.4.b.) .....		3	
<sup>1</sup> Electives .....	3	4	6
	17	18	17

See COURSES OF INSTRUCTION section of this catalog for descriptions of courses in Statistics and other subjects.

<sup>1</sup> At least 15 units must be selected with the approval of adviser in one field in which statistics is applied.

<sup>2</sup> To be selected in accordance with the General Education-Breadth requirements. (Please see page 98 of this catalog.)

<sup>3</sup> Selected from the following list of courses: MATH 312, MATH 313, MATH 335, MATH 336, MATH 412, MATH 431, MATH 437.





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## **Courses of Instruction**

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## SCHOOLS, DEPARTMENTS AND COURSE PREFIXES

### SCHOOL OF AGRICULTURE ..... AG

Agricultural Education.....	AGED
Agricultural Engineering .....	AE
Agricultural Management .....	AM
Animal Sciences and Industry .....	ASCI, PI, VS
Crop Science .....	CRSC, FRSC, VGSC
Dairy Science.....	DH, DPT
Food Science and Nutrition.....	DFA, FDSC
Natural Resources Management .....	FOR, NRM
Ornamental Horticulture .....	OH
Soil Science .....	SS

### SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN ..... EDES

Architectural Engineering .....	ARCE
Architecture .....	ARCH
City and Regional Planning .....	CRP
Construction Management .....	CM
Landscape Architecture .....	LA

### SCHOOL OF BUSINESS ..... GSB

Accounting.....	ACTG
Business Administration .....	BUS, FIN, MKTG
Economics .....	ECON
Management .....	MGT

### SCHOOL OF ENGINEERING..... ENGR

Aeronautical Engineering .....	AERO
Civil and Environmental Engineering .....	CE, ENVE
Computer Science.....	CSC
Electronic and Electrical Engineering .....	EE, EL
Engineering Technology .....	ET, ETAC, ETEL, ETME, ETMP, ETWT
Industrial Engineering .....	IE
Mechanical Engineering .....	ME
Metallurgical Engineering .....	MET

### SCHOOL OF LIBERAL ARTS ..... HUM

Art and Design .....	ART
English.....	ENGL
Foreign Languages.....	FORL, FR, GER, SPAN
History .....	HIST
Journalism.....	JOUR
Music .....	MU
Philosophy .....	PHIL
Political Science.....	POLS
Social Sciences .....	ANT, GEOG, SOC, SOCS
Speech Communication .....	SPC
Theatre and Dance .....	DANC, TH



## SCHOOL OF PROFESSIONAL STUDIES AND EDUCATION .....

Education .....	ED
Graphic Communication .....	GRC
Home Economics .....	HE
Industrial Technology .....	IT
Military Science .....	MSC
Physical Education and Recreation .....	
Administration .....	PE, PEM, PEW, REC
Psychology and Human Development .....	HD, PSY

## SCHOOL OF SCIENCE AND MATHEMATICS .....

Biological Sciences .....	SCM
Chemistry .....	BACT, BIO, BOT, CONS, ENT, ZOO
Mathematics .....	CHEM
Physics .....	MATH
Statistics .....	ASTR, GEOL, PHYS, PSC
	STAT

## UNIVERSITY LIBRARY .....

LIB



# COURSE DESCRIPTIONS

Courses are listed alphabetically by prefix abbreviation. Prefixes and page numbers on which they begin are listed below.

Descriptions of experimental courses (designated by X following the course number) will be found in the quarterly *Class Schedule*, which is sold in El Corral Bookstore on campus.

Some courses will be shown as cross-listed in the title line. These courses cannot be repeated for credit under the separate prefixes.

## Course Numbering System

The numbering system used is a three-digit system. Courses are generally numbered according to the plan shown below.

- 010–099 Nondegree credit or short courses.
- 100–299 Courses taught primarily in the freshman and sophomore years.
- 300–399 Courses primarily for advanced undergraduate students, generally bearing no graduate degree credit.
- 400–499 Courses for advanced undergraduates and graduate students.
- 500–599 Graduate courses.
- 600–699 Courses for professional advancement within a special field and do not carry credit for degree requirements in any of the curricula.

## Prerequisites

Prerequisites indicate recommended preparation. Course prerequisites cited in this catalog are intended to inform the student of any previous work needed for the course. Eligibility of students who do not meet the stated prerequisites is determined by their academic advisers and the appropriate instructor.

PREFIX	TITLE	BEGINNING ON PAGE
ACTG	Accounting .....	361
AE	Agricultural Engineering .....	362
AERO	Aeronautical Engineering .....	367
AG	Agriculture .....	370
AGED	Agricultural Education.....	371
AM	Agricultural Management .....	373
ANT	Anthropology .....	378
ARCE	Architectural Engineering .....	379
ARCH	Architecture .....	382
ART	Art .....	387
ASCI	Animal Science .....	393
ASTR	Astronomy and Astrophysics.....	396
BACT	Bacteriology .....	396
BIO	Biology .....	397
BOT	Botany.....	401
BUS	Business .....	403
CE	Civil Engineering .....	404
CHEM	Chemistry .....	408
CM	Construction Management.....	414
CONS	Conservation .....	416
CRP	City and Regional Planning .....	417
CRSC	Crop Science .....	421

CSC	Computer Science.....	423
DANC	Dance .....	430
DFA	Dietetics and Food Administration .....	431
DH	Dairy Husbandry .....	433
DPT	Dairy Products Technology .....	434
ECON	Economics .....	435
ED	Education .....	438
EDES	Environmental Design .....	446
EE	Electrical Engineering .....	447
EL	Electronic Engineering .....	450
ENGL	English .....	455
ENGR	Engineering .....	461
ENT	Entomology .....	462
ENVE	Environmental Engineering .....	462
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## ACTG—ACCOUNTING

### **ACTG 204 Income Tax for the Nonaccountant (2)**

Federal and state income taxation of individuals. 2 lectures. Prerequisite: Sophomore standing.

### **ACTG 211 Financial Accounting for Nonbusiness Majors (4)**

Introduction to financial accounting theory and practice with an emphasis on financial statement preparation and analysis. Not open to students in business administration. 4 lectures.

### **ACTG 221, 222 Financial Accounting I and II (4) (4)**

Introduction to financial accounting theory and practice. 4 lectures. Sequence courses.

### **ACTG 301 Managerial Accounting (4)**

Applications of accounting to management decision-making planning and control including cost behavior, budget preparation, and performance reporting. 4 lectures. Prerequisite: MATH 221, STAT 252, ECON 222, CSC 120, and ACTG 211 or ACTG 221 or consent of instructor.

### **ACTG 304 Tax Accounting (4)**

Federal and state income taxation of individuals. 4 lectures. Prerequisite: ACTG 211 or ACTG 221 and junior standing.

### **ACTG 321, 322 Intermediate Accounting I and II (4) (4)**

Rigorous coverage of financial accounting fundamentals. 321 emphasizes mastery of the accounting model, institutional and theoretical structures, and accounting for current items. 322 emphasizes accounting for long-term monetary items and corporate equities. 4 lectures. Prerequisite: ACTG 222 and junior standing. Completion of ACTG 321 with a grade of at least C— for ACTG 322.

### **ACTG 323 Advanced Accounting I (4)**

Specialized topics in financial accounting. Emphasizes partnerships, international accounting, and special corporate reporting issues. 4 lectures. Prerequisite: ACTG 322.

### **ACTG 400 Special Problems for Advanced Undergraduates (1–4)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Junior standing or consent of instructor.

### **ACTG 402 Advanced Cost Accounting (4)**

Process and standard costs; overhead costs, budgeting. Use of cost accounting data in economic analyses and managerial control. 4 lectures. Prerequisite: ACTG 301.

### **ACTG 404 Taxation of Partnerships, Estates and Trusts and Complex Capital Transactions (4)**

Federal and state income taxation of partnerships, estates and trusts. Federal and state gift and death taxes. 4 lectures. Prerequisite: ACTG 304.

### **ACTG 405 Corporate Tax Accounting and Tax Administration (4)**

Federal and state income taxation of regular and Subchapter S Corporations, tax administration, and IRS practice. 4 lectures. Prerequisite: ACTG 304.

### **ACTG 424 Advanced Accounting II (4)**

Business combinations, governmental entities, and nonbusiness organizations. 4 lectures. Prerequisite: ACTG 322. ACTG 323 is not prerequisite to ACTG 424.

### **ACTG 431 Professional Accounting (4)**

Development of the accounting profession. Past, present and future. Emphasis on contemporary issues confronting the professional accountant and his/her social and ethical responsibilities and opportunities. 4 lectures. Prerequisite: ACTG 323 or consent of instructor.

### **ACTG 446 Auditing (4)**

Professional auditing: theory, philosophy and problems. 4 lectures. Prerequisite: ACTG 323 or consent of instructor. MGT 321 is recommended.

**ACTG 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

**ACTG 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ACTG 500 Individual Study (1-4)**

Advanced study planned and completed under direction of departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

## AE—AGRICULTURAL ENGINEERING

**AE 121 Agricultural Mechanics (2)**

Identification and use of tools and materials; shop safety and fire prevention; tool sharpening and care; concrete mixes and materials; simple electric wiring; metal work; pipe fitting; basic woodworking; estimating quantities and costs. Students are required to meet safety regulations in laboratory work. 1 lecture, 1 laboratory.

**AE 122 Agricultural Mechanics (2)**

Design, construction and repair of production equipment for livestock, dairy, poultry, and farming equipment. 1 lecture, 1 laboratory. Prerequisite: AE 121 or demonstrated equivalent ability.

**AE 124 Small Power Units (2)**

Operating principles of the small internal combustion engine. Maintenance and trouble-shooting applications of small power units to mowers and other landscape equipment. Repair procedures related to economic justifications. 1 lecture, 1 two-hour activity.

**AE 128 Agricultural Mechanics (3)**

Introduction to agricultural engineering and mechanized agriculture. Career opportunities. Problem solving techniques. Selection of materials for agricultural construction. Laboratory skills development in wood, metal, concrete and pipework. 2 lectures, 1 laboratory. Prerequisite: Majors only, MATH 113 or equivalent, high school drafting or concurrent enrollment in ETME 131 or AE 133.

**AE 131 Agricultural Surveying (2)**

Introduction to basic surveying techniques as applied to agriculture. Keeping field notes; land measurement by tape; differential and profile leveling; contour and plane table mapping; land surveying and identification; fundamentals of land grading. 1 lecture, 1 laboratory. Prerequisite: MATH 103.

**AE 133 Agricultural Drafting (3)**

Technical drawing oriented toward working drawings of agricultural engineering components and systems. Freehand sketching and instrument techniques. Multiview projection and pictorial drawings. 1 lecture, 2 laboratories. Not open for credit to students with previous college level drafting course work.

**AE 134 Agricultural Electrification (3)**

Fundamentals of circuits, electric wiring and code regulations, electrical distribution and the wiring of agricultural structures. Selection, installation, and maintenance of electric motors. Emphasis on practical applications. 2 lectures, 1 laboratory. Prerequisite: MATH 103 or MATH 113 or equivalent.

**AE 141 Agricultural Tractors and Equipment Skills (3)**

Skills in the practical operation of tractors and equipment. Supervised operation on modern farm and utility-industrial equipment. 2 lectures, 1 laboratory.

**AE 142 Agricultural Power and Machinery Management (4)**

Evaluation of agricultural tractors and machinery performance. Power applications and hydraulic systems. Evaluation of performance of tillage, seeding and planting, weed control, hay and grain harvesting, and farm processing equipment. Emphasis on management. Selection, operation, maintenance, and cost analysis. 3 lectures, 1 laboratory. Prerequisite: MATH 113.

**AE 143 Power and Machinery (4)**

Performance of tractors and machinery. Evaluation of tillage, planting, and harvesting operations. Analysis and development of optimum mechanical systems. 3 lectures, 1 laboratory. Prerequisite: MATH 114 or equivalent, AE 128.

**AE 200 Special Problems for Undergraduates (2-4)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

**AE 231 Agricultural Building Construction (3)**

Development of practical skills in carpentry and light construction. Selection of materials. Agricultural buildings repaired, constructed, or modified during laboratory periods. 1 lecture, 2 laboratories. Prerequisite: AE 128 or consent of instructor.

**AE 232 Agricultural Structures Planning (3)**

Environmental factors affecting crop storage structures and animal housing. Insulation, heating, ventilation, water supply, and waste disposal. Functional planning of production systems. Application of solar energy to agriculture. 2 lectures, 1 laboratory. Prerequisite: AE 128, PHYS 132 and college drafting.

**AE 234 Agricultural Power Transmission and Mechanics (3)**

Elements in the utilization and transmission of power in agricultural equipment. Emphasis on V-belt, roller chain, gear, and shaft drive. 2 lectures, 1 laboratory. Prerequisite: AE 142, PHYS 121.

**AE 236 Principles of Irrigation (4)**

Land grading design, operation, management, and evaluation of irrigation methods. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: MATH 141, AE 237, SS 121, a computer programming course.

**AE 237 Engineering Surveying (2)**

Selection, care and use of tapes, levels and transits. Keeping field notes; land measurements by tape; differential and profile leveling; and the plotting of profiles. Introduction to the transit; field operation; introduction to traverses. 1 lecture, 1 field period. Prerequisite: MATH 115 or equivalent; college drafting.

**AE 238 Engineering Surveying (2)**

Traverses by transit-tape. Adjustments, coordinates, and area calculations. Earthwork and landgrading. Topographic mapping. Electronic distance measurements. Land legal descriptions. 1 lecture, 1 field period. Prerequisite: AE 237.

**AE 239 Engineering Surveying (2)**

Parabolic curves, circular curves, cross sectioning, setting slope stakes, measuring earth volume, cuts and fills as applied to road beds, public land surveys, photogrammetry. 1 lecture, 1 field period. Prerequisite: AE 238.

**AE 240 Agricultural Engineering Laboratory (1-2)**

Total credit limited to 4 units with no more than 2 units in any one quarter. 1 or 2 laboratories.

**AE 301 Closed Circuit Hydraulics (3)**

Proper selection and maintenance of machine components using standardized design procedures and manufacturer's design literature. 2 lectures, 1 laboratory. Prerequisite: AE 234 or AE 312.

**AE 312 Hydraulics (4)**

Static and dynamic characteristics of liquids, flow in open and closed channels, uniform and nonuniform flow, flow measurement, pumps. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, ME 211.

**AE 315 Hydrology (3)**

Collection, organization and use of precipitation and runoff data, flood frequency and economics of structures, stream gauging and use of hydrograph, principles of groundwater management and flood routing. 3 lectures. Prerequisite: MATH 141 or consent of instructor.

**AE 321 Agricultural Safety (3)**

Principles of agricultural safety; accident causation and prevention; hazard identification and abatement; laws and regulations; machinery, electrical, chemical, livestock, shop and fire safety; rural crime prevention; safety program development. 3 lectures. Prerequisite: Junior standing.

**AE 323 Agricultural Products Handling (3)**

Application of product handling techniques and equipment to the processing of agricultural commodities. 2 lectures, 1 laboratory. Prerequisite: PHYS 123 or consent of instructor.

**AE 324 Principles of Agricultural Electrification (4)**

R-L-C circuit fundamentals. Applications of electricity in agriculture including circuit fundamentals. Materials, code regulations, electrical measurements, system planning, motors, basic electronics, and an introduction to computer usage. 3 lectures, 1 laboratory. Prerequisite: AE 134, MATH 115, PHYS 123.

**AE 326 Off-the-Road Locomotion (3)**

Sources and systems for supplying power to off-the-highway vehicles. Theory of traction, soil equipment mechanics, prime mover and implement combinations. 2 lectures, 1 laboratory. Prerequisite: AE 143, ME 211, ME 302.

**AE 328 Computer Interfacing and Measurements (3)**

Use of engineering measurements and logic control. Transducers, signal processors, and computer interfacing for agricultural engineering. 2 lectures, 1 laboratory. Prerequisite: EE 201, EE 261, ENGR 251.

**AE 331 Irrigation Theory (3)**

Plant-water-soil relations using evapo-transpiration, plant stress, soil moisture deficiency, frequency and depth of irrigation, salinity, infiltration, drainage and climate control. Miscellaneous course fee required—see *Class Schedule*. 3 lectures. Prerequisite: AE 236, SS 121, MATH 141 or approval of instructor.

**AE 333 Finite Element Analysis Applications (3)**

Introduction to the theory of finite element analysis and its application to drainage, pipe flow, fruit and vegetable damage predictions, structural strength, vibrations, heat transfer, and other Agricultural Engineering problems. Commercially available microcomputer and minicomputer software is used. 2 lectures, 1 laboratory. Prerequisite: AE 328, CE 204, PHYS 133.

**AE 335 Agricultural Power (3)**

Principles of spark ignition and compression ignition engines and related accessories. Service, trouble-shooting, and repair procedures. 2 lectures, 1 laboratory.

**AE 337 Landscape Irrigation (3)**

Design of landscape irrigation systems including soil factors, hydraulics, site information, selection of system components, back flow prevention, plumbing codes and cost estimating. 2 lectures, 1 laboratory. Prerequisite: SS 121 or consent of instructor.

**AE 339 Agricultural Mechanics Skills (2)**

Advanced shop skills. Carpentry, electricity, plumbing, surveying, power mechanics, tractor equipment operation and maintenance. 2 lectures, 2 laboratories weekly for five weeks per session—two sessions per quarter. Prerequisite: Agricultural teacher candidates starting/returning from student teaching, senior or graduate standing or by consent of instructor.

**AE 340 Irrigation Water Management (4)****GEB F.2.**

Soil-plant-water relationships, consumptive use rates and irrigation schedules, water quality, salinity and drainage, water rights and irrigation institutions. Management and evaluation of on-farm irrigation systems; water management; pumps. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: SS 121, MATH 113 or equivalent.



**AE 341 Gasoline Engine Diagnosis (3)**

Use of modern engine testing equipment in the evaluation of agricultural engine components and accessories such as: cylinder condition, ignition systems, electrical systems, and fuel systems. 2 lectures, 1 laboratory. Prerequisite: AE 335 or equivalent.

**AE 342 Diesel Fuel Systems (3)**

Use of modern test and service equipment in evaluating and servicing diesel fuel systems. 2 lectures, 1 laboratory. Prerequisite: AE 335 or equivalent or consent of instructor.

**AE 343 Project Analysis (5)**

Analysis of projects for structural design, applied elements of statics, dynamics, strength materials, fabrication, and fasteners. 4 lectures, 1 laboratory. Prerequisite: AE 133 or equivalent, PHYS 121, AE 234.

**AE 344 Agricultural Equipment Projects (3)**

Construction of special agricultural equipment related to any agricultural enterprise. 1 lecture, 2 laboratories. Prerequisite: AE 343.

**AE 345 Aerial Photogrammetry (3)**

Object recognition, three-dimensional equipment, and interpretation. Print alignment, stereoscopic viewing, scales, elevation determination, and application. Familiarization with geological, agricultural, land and crop management, engineering surveys, construction data, topographic detail, drainage elevation and control. Color photo techniques and uses for pest and disease location and control. 2 lectures, 1 laboratory. Prerequisite: MATH 114.

**AE 347 Principles of Agricultural Machinery (4)**

Principles and evaluation of agricultural power units and machines. Soil equipment mechanics and tractor-implement combinations. 3 lectures, 1 laboratory. Prerequisite: AE 142, AE 343.

**AE 392 Wells and Pumps (3)**

Ground water resources, drilling methods, and development of wells. Kinds of pumps and their agricultural applications. Selection of pumping systems for different water sources. Design of domestic water systems. Water quality standards and water conditioning. 2 lectures, 1 laboratory. Prerequisite: AE 340 or consent of instructor.

**AE 400 Special Problems for Advanced Undergraduates (2-4)**

Individual investigation, research, studies, or surveys of selected problems in agriculture. Total credit limited to 8 units, with a maximum of 4 units per quarter. Prerequisite: Consent of department head.

**AE 403 Agricultural Systems Engineering (3)**

Engineering principles combined with mathematical optimization techniques to evaluate parameters in agricultural production and processing systems. 3 lectures. Prerequisite: IE 314, MATH 242, ENGR 251, STAT 321.

**AE 414 Irrigation Engineering (4)**

Irrigation system design for engineers. Drip, sprinkler, and surface systems; pump selection; irrigation hardware; canal control. Economics of system design and operation. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: AE 236, AE 312, AE 331.

**AE 421 Equipment Engineering (4)**

Design and construction of specialized agricultural components and equipment. 2 lectures, 2 laboratories. Prerequisite: CE 205, ME 212, ETWT 144.

**AE 422 Equipment Engineering (3)**

Analysis and design of agricultural equipment with emphasis on man-machine-plant-automata relationships and concepts. 2 lectures, 1 laboratory. Prerequisite: AE 421.

**AE 425 Computer Controls for Agriculture (3)**

Computer activated controls as applied to agricultural machinery, agricultural structures, processing and irrigation industries. Encompassing control logic to evaluate stability behavior of systems of computer interfacing, data input and control output. 2 lectures, 1 laboratory. Prerequisite: CSC 110 or AM 250.

**AE 427 Agricultural Process Engineering (3)**

Agricultural engineering principles applied to air, water, air-water mixtures, drying, heating, refrigeration, fluid flow, size reduction, fan laws and materials handling. 2 lectures, 1 laboratory. Prerequisite: AE 312, AE 333.

**AE 432 Agricultural Buildings (4)**

Selection of buildings, storage units, and related equipment for production agriculture. Design of beams and column members in wood and steel. Environmental factors affecting crop storage and animal housing. Farmstead layouts. Working drawings and cost estimates. 3 lectures, 1 laboratory. Prerequisite: AE 133, AE 231, AE 343.

**AE 433 Agricultural Structures Design (4)**

Structural analysis and design of agricultural service and processing buildings. Emphasis on use of wood, metals, and reinforced concrete in light construction. 3 lectures, 1 laboratory. Prerequisite: AE 232, CE 205.

**AE 435 Drainage (3)**

Flow of water in porous media; intrinsic permeability and hydraulic conductivity; flow nets; wells and ground water; design of sub-surface drains. 2 lectures, 1 laboratory. Prerequisite: AE 312, AE 331, or AE 340 and consent of instructor.

**AE 440 Agricultural Irrigation Systems (4)**

Basic irrigation system design for nonengineers. Hydraulics, pump selection, irrigation hardware, canals, chemical injection. Layout and design of drip, sprinkler and surface irrigation systems. Miscellaneous course fee required— see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: AE 340.

**AE 445 Remote Sensing (3)**

Digital analysis of LANDSAT images. Topographic map production with stereoscopic map plotting instruments. Emphasis on laboratory experience. Some computer experience required. 2 lectures, 1 laboratory. Prerequisite: AE 345.

**AE 461, 462 Senior Project (2) (2)**

Solution of an engineering problem in agriculture. Involves research methodology: problem statement, analysis, synthesis project design, construction (when feasible), and evaluation. Project requires 120 hours with a minimum of faculty supervision.

**AE 463 Undergraduate Seminar (2)**

Group discussion of current agricultural engineering topics presented by individual members of the class. Placement opportunities and requirements. 2 seminars.

**AE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**AE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**AE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Graduate standing and consent of instructor.

**AE 521 Engineering of Agricultural Systems (4)**

Problem solving by analyzing the need, establishing boundaries and developing creativity. Examples worked through in practicability analysis, transportation problems, linear programming and system analysis with an emphasis on optimum system operation. 3 lectures, 1 laboratory. Prerequisite: Graduate standing.

**AE 522 Agricultural Process Control/Microprocessors (4)**

Engineering principles involved in handling, conditioning, and storage of agricultural products. Advanced practical analysis and design of agricultural systems from harvest to utilization. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

**AE 533 Advanced Irrigation System Design (4)**

Irrigation project water delivery schedules, water user organizations, reliability, and productivity. Manual control and automation of canal and pipeline delivery systems. International emphasis. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: AE 340, Graduate standing, or consent of instructor.

**AE 581 Graduate Seminar in Agricultural Engineering (3)**

Current engineering problems and recent developments as they relate to agriculture. Problem identification, statement and research methodology emphasized in problem solution. 3 seminars.

**AERO—AERONAUTICAL ENGINEERING****AERO 102 Introduction to General Aviation (3)****GEB F.2.**

Fundamentals of aerodynamics and principles of flight. Introduction to power systems and instrumentation used by general aviation aircraft. Principles of air navigation. Interpretation of weather data, uses of flight computer, applicable Federal Aviation Regulations, subjects covered in the private pilot's examination. Not acceptable as a technical elective for engineering students. Not open for technical credit to Aeronautical Engineering students. 3 lectures.

**AERO 121, 122, 123 Aerospace Fundamentals (1) (1) (1)**

Introduction to the engineering profession including the aeronautical and aerospace fields. Engineering approach to problem-solving and analysis of data obtained from experiments. Basic nomenclature and design criteria used in the aerospace industry. Applications to basic problems in the field. 1 laboratory.

**AERO 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**AERO 201 Aerodynamics I (3)**

Introduction to applied aerodynamics. Primary emphasis on aircraft, performance and basic aerodynamics. Subjects covered: atmosphere, wing theory, drag, airfoil theory, static flight performance and dynamic flight performance. 3 lectures. Prerequisite: MATH 143.

**AERO 202 Problems in Aeronautical Engineering (2)**

Introduction to problem solving techniques in aeronautical engineering. Primary emphasis on the solution of problems encountered in the profession. Subjects covered: aircraft performance, take-off and landing distance, rate of climb and endurance, and other such problems associated with the design and performance of aircraft. 2 laboratories.

**AERO 240 Additional Engineering Laboratory (1-2) (CR/NC)**

Total credit limited to four units, with not more than two units in any one quarter. Credit/No Credit grading. 1 or 2 laboratories.

**AERO 301, 302, 303 Aerothermodynamics (5) (5) (3)**

Properties and characteristics of fluids, fluid statics and dynamics, the thermodynamic relations, laminar and turbulent subsonic flows as applied to flight vehicles. Introduction to heat transfer. 5 lectures, fall and winter; 3 lectures, spring. Prerequisite: ME 211, MATH 242.

**AERO 304 Experimental Aerothermodynamics (2)**

Laboratory experiments verify the momentum and energy equations; fan performance, boundary layer measurements, diffuser performance, heat transfer and solar collector performance experiments are evaluated. 1 lecture, 1 laboratory. Prerequisite: AERO 301, 302 and concurrent AERO 303.

**AERO 306 Aerodynamics II (3)**

Introduction to theoretical aerodynamics. Primary emphasis in the subsonic region. Basic aerodynamic theory: Airfoil theory, wing theory, lift and drag. Performance analysis. 3 lectures. Prerequisite: AERO 201 and concurrent AERO 302.

**AERO 307 Wind Tunnel and Flight Test Laboratory (2)**

Wind tunnel testing techniques such as measurement of lift, drag, pressure distribution, and dynamic response of vehicles. Test techniques and data reduction of flight systems. 1 lecture, 1 laboratory. Prerequisite: AERO 201.

**AERO 324 Stress Analysis (4)**

Truss analysis; torsion of space frames and box beams. Shear and bending of straight and curved beams. Moment and product of inertia; Mohr's circle. Normal and shear stresses for beam bending about non-principal axes; the shear center. Beam columns under various loading and support conditions. Laboratory projects dealing with aerospace structures. 3 lectures, 1 laboratory. Prerequisite: MATH 242, CE 204, CE 205.

**AERO 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**AERO 401 Propulsion Systems (4)**

Power plant types, components, characteristics, and requirements. Principles of thrust and energy utilization. Thermodynamic processes and performance of turboprop, turboshaft, turbofan, turbojet, ramjet, and rocket engines. 3 lectures, 1 laboratory. Prerequisite: AERO 404.

**AERO 404 Gas Dynamics (4)**

Fundamental theory of one dimensional gas dynamics: Isentropic flow, flow in converging-diverging nozzles, shock propagation, normal and oblique shock theory, Prandtl-Meyer expansions, Fanno line flow, and measurement methods. 4 lectures. Prerequisite: AERO 303.

**AERO 405 Aerodynamics III (3)**

Review of gas dynamics, shock-wave and boundary-layer interaction, compressible subsonic and transonic flows over airfoils, 2-dimensional supersonic flows around thin airfoil, finite wing in supersonic flow. 3 lectures. Prerequisite: AERO 404.

**AERO 408 Advanced Flight Vehicle Structural Analysis (4)**

Deformation of determinate and indeterminate structures. Virtual work. Dummy load method, Maxwell-Betti reciprocal theorem, Castigliano's theorem. Introduction to matrix methods. 3 lectures, 1 laboratory. Prerequisite: AERO 324, MATH 318.

**AERO 409 Flight Test (3)**

Flight test instrumentation, obtaining of data and methods of data reduction for determining aircraft and engine performance, aircraft stability and control and structural integrity. Evaluation of factory data, including weight and balance compliance with specifications. 1 lecture, 2 laboratories. Prerequisite: AERO 201.

**AERO 411 Space Technology (3)**

Motion of a body in the central force field. Space vehicle trajectories, guidance systems, power generators for interplanetary travel, structural loading, and principles of space vehicle design. 3 lectures. Prerequisite: Consent of instructor.

**AERO 412 Composite Structures Analysis and Design (4)**

Behavior of unidirectional fiber composites. Properties of short-fiber composites, and orthotropic lamina. Analysis of laminated composites. Strength and hygrothermal behavior of composite materials. Structural optimization. Bending, buckling, and vibration of laminated plates. Fracture mechanics of composite structures. 3 lectures, 1 laboratory. Prerequisite: AERO 324 or ME 327.

**AERO 416 Unconventional Aircraft (3)**

Introduction to analysis of rotary wing aircraft, VTOL, STOL, and lifting body vehicles. Types of flight control mechanism. Performance and stability of vehicles. 3 lectures. Prerequisite: AERO 306.

**AERO 418 Introduction to Flight Simulation (3)**

Developmental and training flight simulators. Flight dynamics of rigid aircraft. Alternative simulation system configurations. Cockpit instrumentation and controls. Interface systems. Host computers. Peripheral processors. Visual, sound, and motion systems. Simulation software. Operation of flight simulators. Applications of flight simulation in the aerospace industry. 2 lectures, 1 laboratory. Prerequisite: MATH 242, AERO 420 or EE 309 and EE 319 or CSC 360 or ME 422.

**AERO 420 Stability and Control of Aircraft I (3)**

Equations of motion of the airplane in six degrees of freedom and the aerodynamic forces involved. Static longitudinal and directional stability. Lateral motion and control. 3 lectures. Prerequisite: AERO 306.

**AERO 421 Stability and Control of Aircraft II (3)**

General equations of unsteady motion, the stability derivatives, longitudinal and lateral stability of uncontrolled motion, aircraft response to controls. 3 lectures. Prerequisite: AERO 420.

**AERO 423 Flight Control Systems (3)**

Dynamic system models of rigid aircraft. Feedback control system principles. Components of flight control systems. Longitudinal and lateral control. Altitude and heading hold autopilots. Stability augmentation. Gust alleviation. Engine controls. Handling qualities specifications. Simulation of flight control systems. 2 lectures, 1 laboratory. Prerequisite: MATH 242 and AERO 420.

**AERO 444, 445 Flight Vehicle Design (4) (4)**

Preliminary layout of a typical transport aircraft and a space vehicle using design and calculation techniques developed in previous aeronautical engineering courses. Design of selected component structures and preparation of necessary drawings. 2 lectures, 2 laboratories. Prerequisite: AERO 306, AERO 324.

**AERO 461, 462 Senior Project (2) (3)**

Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

**AERO 464 Industry Seminar (1)**

Speakers from the aircraft and aerospace industry invited to present current topics within the industry. 1 seminar.

**AERO 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**AERO 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**AERO 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**AERO 501 Advanced Flight Dynamics (3)**

Derivation of full six degrees of freedom of motion of missiles and space vehicles in both linear and nonlinear applications; closed form and computer numerical integrations; advanced dynamic flight testing and dynamic wind tunnel testing. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

**AERO 502 Flight Simulation (4)**

Flight simulation facilities development and applications. Six-degree-of-freedom flight dynamics models. Function generation. Effects of real time hardware in simulation systems. Host computer executive programs. Peripheral processors. High speed drivers and system. Interface systems. Avionics systems simulation. 3 lectures, 1 laboratory. Prerequisite: AERO 418.

**AERO 503 Advanced Structural Analysis (3)**

Deformations of aircraft structures due to static and dynamic loads. Computation of natural mode shapes and frequencies. Determination of dynamic stress fields in aircraft due to transient motions caused by external forces. 3 seminars. Prerequisite: ME 427 or senior level structural design course, graduate standing or consent of instructor.

**AERO 505 Theoretical Aerodynamics (3)**

Fundamentals of analytical aerodynamics, potential flow, vortex theory, circulation, Kutta Joukowski theorem, lifting line theory, three-dimensional lift and drag of wings, performance, stability and control. 3 seminars. Prerequisite: AERO 306 or equivalent, graduate standing or consent of instructor.

**AERO 506 Elements of Rocket Propulsion (3)**

Analysis and design of liquid and solid rockets using basic design parameters such as droplet atomization, droplet and particle combustion, heat transfer, combustion stability and control, and thermochemical computations. 3 seminars. Prerequisite: AERO 401 or equivalent, graduate standing or consent of instructor.

**AERO 508 Computational Fluid Dynamics (3)**

Numerical solution by finite differences of partial differential equations in fluid dynamics. Application to boundary layer and transport processes. 3 lectures. Prerequisite: AERO 303, graduate standing or consent of instructor.

**AERO 509 Introduction to Boundary-Layer Theory (3)**

Concept of the boundary-layer. Boundary-layer equations, the similarity concept, fundamental similarity solutions, the thermal boundary-layer. 3 lectures. Prerequisite: AERO 303 or equivalent, graduate standing or consent of instructor.

**AERO 570 Selected Advanced Topics (3)**

Directed group study of selected topics for graduate students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

**AERO 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

## **AG—AGRICULTURE**

**AG 100 Agriculture Enterprise Project (1–4) (CR/NC)**

Selection and completion of a management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Registration is through department offices and subtopics will list the department supervising the project. Credit/No Credit grading. Repeatable.

**AG 243 Competitive Intercollegiate Rodeo (2) (CR/NC)**

Beginning through advanced skills in the event areas of college rodeo. Areas include saddle bronc, bareback, and bull riding; calf, team, and breakaway roping; steer wrestling, goat tying, and barrel racing. Minimum of 10 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading. Enrollment limited to those qualified to compete in intercollegiate rodeo. Consent of coach required.

**AG 301 Agriculture and American Life (3)****GEB F.2.**

Relationship of agriculture and natural resources to man and his society. Impact of soil, water, and land uses on animal and crop production within the United States. Relative importance of resources used and commodities produced. Not open to students with majors in agriculture. 3 lectures. Prerequisite: Junior standing.

**AG 339 Internship in Agriculture (1-12) (CR/NC)**

Selected students will spend up to 12 weeks with an approved agricultural firm engaged in production or related business. Time will be spent applying and developing production and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of internship instructor.

**AG 500 Individual Study (1-3)**

Advanced independent study planned and completed under the direction of a member of the school faculty. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**AG 539 Graduate Internship in Agriculture (1-9)**

Application of theory to the solution of problems of agricultural production or related businesses in the field. Analyze specific management problems and perform general management assignments detailed in a contract between the student, the firm or organization, and the faculty adviser before the internship commences. Prerequisite: Consent of internship instructor.

**AG 599 Thesis (1-9)**

Individual research under the general supervision of the faculty, leading to a graduate thesis of suitable quality. Total credit limited to 9 units. Prerequisite: Graduate standing and consent of instructor.

**AGED—AGRICULTURAL EDUCATION****AGED 202 Introduction to Agricultural Education (2)**

Overview of agricultural education programs including goals and purposes. Kinds of classes and types of programs. Qualifications essential to success in teaching agriculture. Planned program of studies to meet requirement for teaching. 2 lectures.

**AGED 220 Agriculture Youth Conferences (2-3) (CR/NC)**

Problems encountered and practices applied during the conduct of the annual FFA State Convention. Methods, procedures and materials adapted for use by the student in developing the committee system to produce conferences, conventions and/or workshops of all kinds and sizes. Repeatable, total credit limited to six units. Credit/No Credit grading only. 2-3 activities. Prerequisite: Consent of instructor.

**AGED 303 F.F.A. Programs and Activities (2)**

Implementation processes and operational procedures for conducting an F.F.A. Chapter activities program appropriate to community, school and student needs. F.F.A. leadership training, proficiency awards, foundation programs and educational field days. 2 activities. Prerequisite: AGED 202 and consent of instructor.

**AGED 339 Supervised Agricultural Experiences (2)**

Supervised observation and participation in public school and/or agricultural industry. Exposure to processes and procedures for supervising rural youth organizations and occupational experience programs. 2 activities. Prerequisite: AGED 202 and consent of instructor.

**AGED 350 Undergraduate Field Experience (1)**

Practices in education and motivational techniques used for teaching bilingual (Spanish/English) students interested in agriculture and technology. Repeatable, total credit limited to 3 units. 1 lecture. Prerequisite: Junior standing or consent of instructor.

**AGED 351 Undergraduate Field Experience (1)**

Practices in education and motivational techniques used for teaching bilingual (Spanish/English) students interested in agriculture and technology. Repeatable, total credit limited to 3 units. Prerequisite: Junior standing or consent of instructor.

**AGED 412 Teaching Resources (1)**

Survey of teaching resources for the vocational agriculture teacher. Utilization of time management principles in the development of effective course and unit planning. Systematic filing practices, use of audiovisual materials. 1 lecture. Prerequisite: Senior standing.

**AGED 424 Organizing and Teaching Agriculture (3)**

Determining course objectives, content, and calendar for use by the teacher in classroom, shop and field instruction while assigned to community schools. Concurrent with student teaching. 3 activities. Prerequisite: AGED 438 and consent of instructor.

**AGED 438 Instructional Processes in Agricultural Education (3)**

Preparation for student teaching in agriculture. Orientation to classroom situation. Development of plans for teaching including daily lessons and unit plans; utilization of source information and resources. Class demonstration in teaching procedures; analysis and evaluation. 1 lecture, 2 activities.

**AGED 440 Student Teaching in Agricultural Education (6-12)**

Off-campus assignment to a selected cooperating public school. Participation in all phases of agriculture teacher duties and activities including departmental organization and administration. Prior approval and appointment necessary. Total limited to 18 units.

**AGED 441 Student Teaching Practicum (2)**

Problems encountered and practices applied during student teaching. Methods, procedures and materials adapted for use by the teacher concurrent with student teaching. 2 activities. Prerequisite: Consent of instructor.

**AGED 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**AGED 463 Undergraduate Seminar (2)**

Group discussion of current agricultural education topics presented by individual class members. Topics or papers presented by guest speakers. Placement opportunities and requirements. 2 seminars.

**AGED 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**AGED 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**AGED 513 Field Experience—Vocational Agriculture (1-3)**

Practice and techniques in management and supervision of vocational agriculture programs. Relationships among students, staff, community and school groups. Budgeting, staffing, records, reporting. Student activities and Future Farmers of America programs. Total credit limited to 6 units. Prerequisite: Prior approval and appointment.

**AGED 520 Program Development in Agricultural Education (3)**

Development of up-to-date approaches to a total integrated program based on occupational opportunities and community needs. Philosophy, organization and administration of agricultural education programs. Development in such areas as curriculum, supervised occupational experience, Future Farmers of America, and summer programs. 3 seminars.



**AGED 521 Natural Resources Management for Educators (3) (Also listed as NRM 521)**

Philosophy (theoretical and applied) of natural resource management strategies functioning in today's environment. Ecological principles applicable to each component as they relate to the present perception of today's resource base, use demands, and projected utilization. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**AGED 522 Instructional Programs in Agricultural Mechanics (3)**

Organizing the vocational agriculture mechanics curriculum and determining course content. Student demonstrations and presentations; evaluation and analysis. 1 seminar, 2 laboratories.

**AGED 580 Special Problems in Agricultural Education (1-3)**

Individual study of modern issues and problems conducted through research, planning and development. Field problems and in-service study in agricultural industry encouraged. Final written report required. Total credit limited to 9 units with not more than 3 units in any one quarter. Prior approval of instructor required.

**AM—AGRICULTURAL MANAGEMENT****AM 100 Orientation to Agricultural Management (1) (CR/NC)**

Understanding the depth and breadth of agricultural management, the agricultural industry, the university, and the Agricultural Management Department. Emphasis on career and curriculum orientation. Required of all transfer students who have not completed a course in Introduction to Agricultural Management. Credit/No Credit grading only. 1 activity.

**AM 101 Introduction to Agricultural Management (3)**

Relationship of agricultural management to characteristics, problems and challenges of agriculture. Student report on background, goals and educational plan. 3 lectures. Prerequisite: Agricultural Management major of freshman standing or consent of instructor.

**AM 102 Introduction to Agricultural Economics (3)**

Introduction to the economic aspects of agricultural management. Role of resources in agricultural production. Survey of trade, policy, and marketing activities of agriculture. 3 lectures.

**AM 109 Farm Bookkeeping (4)**

Farm record keeping for tax, management and credit purposes using the cash method of accounting. An overview of the accrual system and measures of farm profits. Not for credit towards B.S. degree for majors in the School of Agriculture; to be taken by technical students only. 3 lectures, 1 two-hour laboratory.

**AM 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**AM 201 Agricultural Business Sales and Service (3)**

Growth and opportunities in agricultural sales. Factors involved in developing sales program for the farm operation. Application of successful selling principles and practices in providing farm operators with agricultural materials, supplies, equipment and services. Consideration given to sales and service for farm related businesses and nonagricultural customers. Selling aspects involved in marketing of farm products by farm related businesses. 3 lectures.

**AM 203 Agricultural Business Organization (3)**

Development, types and forms of farm related businesses. Agricultural businesses considered from standpoint of primary functions, services and problems including such factors as business organization information systems, labor and production planning. Emphasis on California farm related industries. 3 lectures.

**AM 212 Agricultural Economics (3)**

Changes in agriculture and agricultural production in response to changing economic conditions. Optimum methods of agricultural production. Impact of technological change. Evaluating market structure and price formulating factors for agricultural products and inputs. 3 lectures. Prerequisite: AM 102.

**AM 213 Agricultural Economic Analysis (4)**

Role of price in the economy, the firm as a decision-making unit, the production function, single input-output analysis, substitution relationships, products combinations, risk analysis, consumption and market demand influence, population and technological changes. 4 lectures. Prerequisite: AM 212, MATH required for major.

**AM 250 Computer Application to Agriculture (3)****GEB F.1.**

Use of library programs available for agriculture. Use of auxiliary equipment available at commercial computer centers. Statistical and other computer programs applied to agriculture problems. 3 lectures.

**AM 300 Successful California Farms (2)**

Visits to successful California farms involving many types of farming. Farm resources and organization, techniques of operation, yields, problems. Different regions visited on different trips. Can only be taken once for credit in the major.

**AM 301 Agricultural Marketing (3)**

Agricultural commodity marketing systems from farm to consumer. Middlemen types and marketing alternatives. Role of futures markets in pricing and risk minimization. Storage, transportation and grading systems. Selected topics such as foreign trade and marketing orders. 3 lectures. Prerequisite: AM 212 or ECON 201 or ECON 212.

**AM 302 Agricultural Cooperative Organization and Management (3)**

Purpose, kinds, organization and management of agricultural cooperatives. Emphasis on California cooperatives, their characteristics, operation and future. One-day field trip visiting agricultural cooperatives included. 2 lectures, 1 two-hour laboratory.

**AM 305 Agricultural Resources (3)**

Survey of agricultural production areas of United States from standpoint of physical resource, markets, economic advantages, and problems. Appraisal of area problem from standpoint of land economic principles. 3 lectures. Prerequisite: AM 212, ECON 201 or ECON 211 or ECON 222.

**AM 307 World Agricultural Resources (3)**

World agricultural production areas with emphasis on natural and human resources, existing production, economic implications, population growth and potential food supply. 3 lectures. Prerequisite: AM 212, ECON 201 or ECON 211 or ECON 222.

**AM 310 Agricultural Credit and Finance (3)**

Fundamentals of financing California's agricultural industry. Principles of making investment decisions and costs of credit. Developing credit strategies within the framework of sources of credit and types of loans available to farms, ranches, and agribusiness firms. 3 lectures. Prerequisite: One quarter of accounting or farm records.

**AM 312 Agricultural Policy (3)**

Agricultural policy objectives and formulation, resource allocation and production adjustments. Survey of government's influence in the planning and practices of farmers and agricultural businesses. 3 lectures. Prerequisite: AM 212, ECON 201 or ECON 211 or ECON 222.

**AM 314 Fair Management (3)**

Principles and procedures in organizing, managing and promoting fairs. Emphasis on California and Western fairs. Career opportunities, programs and problems in fair management and growth of fairs in America. A one-day field trip is required. 3 lectures.

**AM 315 Land Economics (3)**

Supply of land, population pressure on land, input-output relations affecting land use, economic returns, land values, development and investment costs, locational factors, conservation, institutional factors, leasing, land use planning, taxation, public regulations. 3 lectures. Prerequisite: AM 212, ECON 201 or ECON 211 or ECON 222.

**AM 317 Agriculture—Consumer Relationships (3)**

Basic facts, public opinion and ways of developing greater understanding of agriculture, its nature, characteristics, problems and relationship to nonfarm persons. Consumer education programs and procedures. Field trip is required. 3 lectures.

**AM 318 Agricultural Trade Policies (3)**

Analysis of American trade policies and their relationship to agriculture. International trade pacts and their influence on agricultural production and marketing. 3 lectures. Prerequisite: AM 212, AM 301, ECON 201 or ECON 221 or ECON 222.

**AM 321 Farm Records (4)**

Fundamentals of record keeping, kinds of records, inventory, depreciation, payrolls, cash and accrual basis of income tax reporting, financial statements and analysis. 3 lectures, 1 two-hour laboratory.

**AM 322 Principles of Farm Management (4)**

Organization and operation of farm and ranch businesses. Identification of factors affecting profitability and implementation of them in the evaluation of the business to increase efficiency and profit. Application of budgeting to laboratory farms and independent analysis of a farm for the term report. 3 lectures, 1 two-hour laboratory. Prerequisite: AM 321 or ACTG 211.

**AM 323 Agricultural Business Managerial Accounting (4)**

Agricultural business management with an emphasis on using accounting procedures that will provide useful information in making management decisions, setting objectives, and controlling operations. 3 lectures, 1 two-hour laboratory. Prerequisite: ACTG 211.

**AM 324 Agricultural Property Management and Sales (4)**

Land economic, legal and real estate principles in the investment, development, leasing, mortgaging and transferring of agricultural real estate. 3 lectures, 1 two-hour laboratory. Prerequisite: AM 310 or consent of instructor.

**AM 325 California Agriculture (3)**

Agricultural regions of California considered from standpoint of physical resources, crops and livestock, size, tenure, water problems, relation to urban areas, land law, land development, and property taxation. 3 lectures.

**AM 326 Farm Appraisal (4)**

Methods of farm appraisal, use of county records, appraisal practice on different types of farms, discussions with professional appraisers. 3 lectures, 1 two-hour laboratory. Prerequisite: AM 212, ECON 201 or ECON 211 or ECON 222 and junior standing.

**AM 331 Large Farm Accounting (4)**

Application of commercial accounting process to large farm accounting problems. Emphasis will be placed on accounting systems that facilitate financial statement presentation, tax preparation and ADP enterprise analysis. Income tax laws pertaining to the farm will be stressed. 3 lectures, 1 two-hour laboratory. Prerequisite: ACTG 211.

**AM 336 Commodity Markets in Agricultural Business (3)**

Commodity market history, performance, and use in management of agricultural business. Techniques of analysis, hedging, speculation with applications to the agricultural business firm. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 212 or consent of instructor.

**AM 360 Agricultural Management Research Methods (3)**

Concepts of research methodology and data presentation in agricultural management. Scientific method and its application to problems in the field. Selection of methodology compatible with the problem. Overview of research from conceptualization to finalized report. 3 lectures. Prerequisite: STAT 212 or STAT 252.

**AM 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**AM 401 Agricultural Labor Relations and Personnel Management (4)**

Agricultural labor trends and problems as determined by changes occurring in farming and farm related industries. Labor-management relations in agriculture; principles and procedures in organizing and managing the agricultural business personnel program. 4 lectures. Prerequisite: Senior standing.

**AM 404 Agricultural Marketing Management (3)**

Marketing management applied to agricultural and food industries. Marketing concept, role of today's middlemen and growing importance of consumerism, ecology and conservation in today's changing market place. Exploration of marketing mix decisions including planning, product management, pricing, promotion and distribution. 3 lectures.

**AM 405 Agricultural Marketing Research Methods (3)**

Collecting, tabulating and analyzing data for use in market research and sales. Techniques for determining market potential. Surveys, trends, correlation, market factor derivation, test marketing. Routing techniques, sampling procedures. 3 lectures. Prerequisite: AM 250, AM 404, STAT 212 or STAT 252.

**AM 406 Agricultural Marketing Communication (3)**

Principles, methods and materials for communicating ideas, information and skills to management, staff members, stockholders, customers and general public. Agricultural business public relations programs. Organization and presentation of surveys, studies, reports and publications. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 404 or consent of instructor.

**AM 409 California Agricultural Law (3)**

Historical and current sources of law, examination of judicial systems, application of contracts, agency, labor law, torts, property and water law, partnerships, corporations and corporate finance applicable to agricultural enterprises. 3 lectures. Prerequisite: BUS 207, senior standing or consent of instructor.

**AM 410 Management Practices in Agricultural Lending (3)**

Advanced loan analysis for major types of farms; legal and tax ramifications in lending; capitalization of agricultural lending institutions. Risk assessment and management for agricultural producers and their creditors. Interest rate expectations and effect on lender behavior. 3 lectures. Prerequisite: ACTG 211, AM 310 and senior standing.

**AM 413 Crop Management Problems (3)**

Management problems of crop farms and orchards: crop enterprise costing procedures, equipment costing and replacement, scheduling of operations to obtain efficiencies, determination of most profitable rotations and levels of input use, planning for changes in operation, orchard development, investment analysis. 3 lectures. Prerequisite: AM 322.

**AM 415 Livestock Management Problems (3)**

Analysis of actual livestock enterprise; budgeting a ranch by enterprises; analysis of internal problems such as bull purchase economics, feed buying chart, feedyard economics, cattle price relationships, livestock systems. 3 lectures. Prerequisite: AM 322.

**AM 416 Dairy Management Problems (3)**

Analysis of actual dairy enterprise; budgeting a dairy farm by enterprises; analysis of problems such as load by load milk-feed analysis, value of milk quotas, most profitable concentrate to hay feeding. 3 lectures. Prerequisite: AM 322.

**AM 421 Agricultural Business Operations Analysis (4)**

Principles and procedures in agricultural business operations analysis and research. Evaluation of programs and problems to achieve optimal decisions. Production and financial data, statistics, pricing, costs, inventories, production level, and plant expansion or contraction. 4 lectures. Prerequisite: AM 213, AM 250, STAT 212 or STAT 252.

**AM 427 Agricultural Estate Planning (3)**

Principles and procedures in agricultural estate planning and conservation. Determining: Beneficiary needs, assets, valuation, and taxes. Utilizing: Wills, property transfers, gifts, insurance, business continuation agreements, trusts and other tools in estate planning. 3 lectures. Prerequisite: Senior standing.

**AM 433 Agricultural Price Analysis (3)**

Application of statistical tools for price analysis. Emphasis on price making process for specific agricultural commodities. Utilization of market reports and production estimate data in price forecasting and analysis. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 250, STAT 212 or STAT 252.

**AM 435 Linear Programming in Agriculture (3)**

Application of linear programming to modern commercial agriculture; assumptions and data requirements; graphic and simplex solutions; preparation, coding and solutions of models simulating current problems. 2 lectures, 1 two-hour laboratory. Prerequisite: AM 213, AM 250.

**AM 440 Field Studies in Agricultural Management (2)**

Visitation to selected agricultural businesses. Organization, operation, services and problems considered. Prerequisite: Senior standing or consent of instructor. Can only be taken once for credit in the major.

**AM 450 Agricultural Strategy Formulation (4)**

Development of strategy for farms and farm related businesses where uncontrollable environment makes output and results highly unpredictable; emphasis on the total enterprise; case analysis. 4 lectures. Prerequisite: AM 310, AM 323.

**AM 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

**AM 463 Undergraduate Seminar (2)**

Individual or group presentation for discussion of subjects and problems within the Agricultural Management field. 2 seminars.

**AM 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**AM 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**AM 510 World Agricultural Development (3)**

Special problems of agriculture in less-developed countries considering the role of economic, social and institutional policies in directing development. 3 seminars. Prerequisite: AM 307 or AM 315.

**AM 515 International Agricultural Marketing (3)**

Organization and function of international agricultural markets with emphasis on developing countries. Factors inhibiting development of an improved agricultural market structure. 3 seminars. Prerequisite: AM 301, AM 307 or consent of instructor.

**AM 516 Communication for Change in Developing Countries (3)**

Analysis of literature, techniques and procedures for planning and carrying out agricultural information programs in developing countries. Current relevant information for foreign agricultural producers. 3 seminars. Prerequisite: AM 307.

**AM 544 Advanced Farm and Ranch Management (4)**

Application of microeconomic, quantitative, and qualitative methods to the evaluation of problems peculiar to the management of the agricultural production unit. Emphasis on methods which will strengthen decision making for efficient resource utilization to enhance quantity and minimize cost of production. 4 seminars. Prerequisite: Second year MBA standing.

**AM 553 Agricultural Policy and Program Analysis (4)**

Economic, political, and social objectives of domestic agricultural policies and programs. Consequences of government's policies and programs to control production, allocate resources, support market prices, and provide benefits to food and fiber producers, marketers, and consumers. Topical analysis of current effort of government to direct agriculture. 4 seminars. Prerequisite: Second year MBA standing.

**AM 554 Managing Price Risk in Agribusiness (4)**

Examination of alternatives available to the agribusiness manager to manage price risk. Use of forward contracts, cooperative seasonal pools, and hedging with futures contracts and options. Futures markets, their function and operation. Analysis of cash-futures price relationships, hedging guidelines, and other topics necessary for successful hedge program execution. Student involvement in a speculation and hedging simulation. 4 seminars. Prerequisite: Second year MBA standing.

**AM 563 Agricultural Trade and Market Development (4)**

Changing agricultural trade prospects in a dynamic world economy. Interface between strategies of government and private firms to create and expand foreign markets for U.S. agricultural products. Impacts of agricultural trade policies, agricultural market development, and the activities of agricultural export marketing firms. 4 seminars. Prerequisite: Second year MBA standing.

**AM 564 Agribusiness Managerial Leadership and Communication (4)**

Small groups analyze an agribusiness case situation with formal oral/written reports to management required. Emphasis on communication skills and leadership qualities, identifying key success requirements. Includes on-site workshop at a large California farm. 4 seminars. Prerequisite: First year MBA standing.

**AM 581 Graduate Seminar in Agricultural Management (3)**

Group study of selected developments, trends and problems in the field. 3 seminars.

**ANT—ANTHROPOLOGY****ANT 201 Cultural Anthropology (3)****GEB D.4.a.**

Meaning and significance of culture to human beings. Examination of how cultures differ in their impact on behavior. How cultures develop and change. 3 lectures.

**ANT 202 World Prehistory (3)**

Development of human cultures in both the Old and New Worlds from the earliest times until the dawn of history; cultural growth. 3 lectures.

**ANT 203 Physical Anthropology (3)**

Facts and problems of human evolution; fossil man; primate evolution and social behavior; human variation. 3 lectures.

**ANT 301 Applied Anthropology (3)**

Application of the basic concepts of anthropology to problems of development. Cross-cultural interaction and culture change using the case-study approach. 3 lectures. Prerequisite: Ant 201 or consent of instructor.

**ANT 310 California Archaeology (3)**

California Indians; field studies in locating, surveying, and analyzing aboriginal sites; excavation of a site; laboratory techniques for recording, preserving, and reporting of artifacts; relating observations and finds to the natural environment in which a site is located. Integrating knowledge of natural and social sciences to use of archaeology. 2 lectures, 1 laboratory.

**ANT 325 Material Culture (3)**

Description of processes of invention and diffusion. Role of environment and primitive technology on culture. Major preindustrial inventions and their social correlations. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

**ANT 333 Language and Culture (3)**

Interrelation between language and other facets of culture. Speech in its social setting. Emphasis on social and cultural factors which influence language variation and language diversity. 3 lectures. Prerequisite: ANT 201 or consent of instructor.

**ANT 341 Comparative Societies (3)**

Comparative study of contemporary peoples and cultures representing the major cultural types. 3 lectures. Prerequisite: ANT 201.

**ANT 360 Human Cultural Adaptation (3)****GEB D.4.b.**

Examination of social and cultural systems as means by which humans adapt to their physical, biotic and social environments. 3 lectures.

**ANT 450 Area Studies (3)**

Comparative analysis of cultures within a selected region (e.g., Southeast Asia, Subsaharan Africa etc.). Up to 12 units may be taken. 3 lectures.

**ANT 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ARCE—ARCHITECTURAL ENGINEERING****ARCE 221 Elementary Structures (3)**

Forces on building structures. Static equilibrium and stability of structural systems. Shear and bending moment diagrams. 3 lectures. Prerequisite: PHYS 131, MATH 142.

**ARCE 222 Mechanics of Structural Members (3)**

Stress-strain relationships; stresses and deformations in structural members due to axial force, torsion, and moment. 3 lectures. Prerequisite: ARCE 221.

**ARCE 223 Structural Analysis I (3)**

Statically determinate and indeterminate structures. Approximate methods. Moment distribution. 3 lectures. Prerequisite: ARCE 222.

**ARCE 224 Structures (6)**

Force on building structures. Static equilibrium and stability of structural systems. Shear and bending moment diagrams. Stress-strain relationships; stresses and deformations in structural members. 6 lectures. Prerequisite: MATH 142, PHYS 131.

**ARCE 225 Dynamics (3)**

Static and dynamic loads, rigid body dynamics. Vibrations of structural members. Degrees of freedom and vibration modes. 3 lectures. Prerequisite: MATH 143, ARCE 223.

**ARCE 226 Structural Systems for Architects (3)**

Concepts of structural integrity and stability, structural subsystems, methods of analysis. 3 lectures. Prerequisite: ARCE 222.

**ARCE 240 Additional Engineering Laboratory (1-2)**

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

**ARCE 301 Stress Analysis Laboratory (1)**

Test and analysis of structural materials. Analysis using strain gauges. Displacement measurements. 1 laboratory. Prerequisite or concurrent: ARCE 222.

**ARCE 302 Structural Analysis II (3)**

Analysis of statically indeterminate structures. Energy methods. Slope-deflection. Moment distribution including sidesway. 3 lectures. Prerequisite: ARCE 223.

**ARCE 303 Steel Design (3)**

Analysis and design of steel structures subject to gravity and lateral loads with emphasis upon the detailed design of members and connections. 3 lectures. Prerequisite: ARCE 223.

**ARCE 304 Timber Design (3)**

Analysis and design of timber structures subject to gravity and lateral loads with emphasis upon the detailed design of members and connections. 3 lectures. Prerequisite: ARCE 223.

**ARCE 305 Masonry Design (2)**

Analysis and design of masonry structures subject to gravity and lateral loads. Load-bearing walls, shear walls, columns and beams, structural details. 2 lectures. Prerequisite: ARCE 223.

**ARCE 306 Matrix Analysis of Structures (3)**

Analysis of statically indeterminate structures by force and displacement methods, including programming for digital computer applications to beams, rigid frames, plane and space trusses, and other structures. 3 lectures. Prerequisite: ARCE 302.

**ARCE 311 Structures for Landscape Architects (3)**

Basic principles of structures and design of landscape structures. 3 lectures.

**ARCE 321 Timber Design (3)**

Timber structures; limitations and potential of the material in relation to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCH 232, ARCE 223.

**ARCE 322 Steel Design (3)**

Design of steel structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCH 232, ARCE 223.

**ARCE 323 Concrete and Masonry Design (3)**

Design of reinforced concrete and masonry structures. Limitations and potential of the material to the design and construction process. For architecture and construction students. 3 lectures. Prerequisite: ARCH 232, ARCE 223.

**ARCE 361 Structural Computing Laboratory (3)**

Introduction to use of digital computers in structural analysis. 3 laboratories. Prerequisite: ARCH 231, ARCE 223, EDES 250. Concurrent enrollment in ARCE 302.

**ARCE 362 Structural Systems Laboratory (3)**

Studies in structure-form relationships, geometry and stability of structural systems. 3 laboratories. Prerequisite: ARCE 361.

**ARCE 363 Steel Design Laboratory (3)**

Design project utilizing structural steel. 3 laboratories. Prerequisite: ARCE 303, ARCE 362.

**ARCE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**ARCE 409 Survey of Foundation Engineering (3)**

Fundamentals of foundation engineering, evaluation of soil reports, principles of determination of bearing capacity, soil classification, selection of types of foundations, evaluation of expansive properties of foundation soils, discussion of basic laboratory tests. 3 lectures. Prerequisite: ARCE 223.

**ARCE 412 Dynamics of Framed Structures (3)**

Analysis of structures subjected to dynamic loads with single- and multi- degrees of freedom. Development of techniques for analysis of structures in response to seismic, wind, and moving loads. Solution of problems by digital computer. 3 lectures. Prerequisite: ARCE 483.



**ARCE 414 Precast Concrete (3)**

Precast and prestressed concrete principles, materials and techniques of construction. Concrete mixes, forming, casting, finishing, curing and erection methods of precast concrete. Design potentials, aesthetics, cost and construction time as related to buildings and other structures. 3 lectures. Prerequisite: ARCE 323 or ARCE 444.

**ARCE 421 Soil Mechanics (3)**

Principles of soil mechanics, including rudiments of geology, soil classification, gravimetric and volumetric relations, compaction, methods and testing, shear strength of soil and strength theories. 2 lectures, 1 laboratory. Prerequisite: ARCE 222, GEOL 201 or consent of instructor.

**ARCE 422 Foundation Design (3)**

Soil-bearing capacity and settlement characteristics of soils. Sizing and design of spread footings. Design and analysis of earth-retaining structures. 3 lectures. Prerequisite: ARCE 421. Corequisite: ARCE 444.

**ARCE 423 Advanced Foundation Design (3)**

Design and analysis of beams on elastic foundations and mat foundations. Pile foundations and sheet pile retaining structures. 3 lectures. Prerequisite: ARCE 422.

**ARCE 444 Reinforced Concrete Design (4)**

Design of reinforced concrete structures. Theory and application to building structural systems. 4 activities. Prerequisite: ARCE 301, ARCE 302 and ARCE 363.

**ARCE 445 Prestressed Concrete Design (4)**

Design and analysis of prestressed concrete structures. 4 activities. Prerequisite: ARCE 301, ARCE 302, and ARCE 363.

**ARCE 446 Advanced Structural Systems (3)**

Multistory buildings, bridges, shells, arches, and cable structures. 3 activities. Prerequisite: ARCE 301, ARCE 306 and ARCE 363.

**ARCE 451 Timber and Masonry Design Laboratory (3)**

Selected projects utilizing timber and masonry. 3 laboratories. Prerequisite: ARCE 302, ARCE 304, ARCE 305.

**ARCE 452 Reinforced Concrete Design Laboratory (3)**

Selected projects utilizing reinforced concrete. 3 laboratories. Prerequisite: ARCE 444.

**ARCE 453 Projects Laboratory (3)**

Final projects by individuals or teams, which may include students from other disciplines or may involve physical modeling and testing. 3 laboratories. Prerequisite: ARCE 363, ARCE 445, ARCE 452.

**ARCE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ARCE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**ARCE 481 Structural Models Laboratory (1)**

Testing and analysis of structural models in timber, steel, concrete and microconcrete, and plastics. 1 laboratory. Prerequisite: ARCE 226 and ARCE 301 or ARCE 302

**ARCE 482 Seismic Laboratory (1)**

Laboratory studies utilizing physical models for the analysis of structures subjected to simulated ground motions. 1 laboratory. Prerequisite: ARCE 306, ARCE 481, ARCE 483.

**ARCE 483 Seismic Design (3)**

Introduction to dynamic response analysis of building structures with emphasis on earthquake ground motion. Earthquake resistant design of buildings in accordance with building codes. Application of computer programs and physical models for seismic design. 3 lectures. Prerequisite: ARCE 225, ARCE 306, ARCE 361, MATH 242.

**ARCE 504 Finite Element Method for Building Structures (3)**

Basic concepts of equilibrium and compatibility; stiffness and flexibility properties of various types of finite elements. Development and application of displacement and force methods. Elastic stability and dynamic response of buildings to earthquake, wind, and moving loads. Use of finite-element computer programs. 3 lectures. Prerequisite: MATH 242, ARCE 306, or consent of instructor.

**ARCE 521 Architectural Structures (3)**

Static and dynamic loads, structural equilibrium and stability, structural configurations and systems, response to dynamic loads, behavior of structures. 2 seminars, 1 activity. Prerequisite: Graduate standing in Architecture.

**ARCE 522 Structural Systems (3)**

Exploration of the relationship between structural systems and architectural form. Understanding of structural stability and structural order is developed through construction of a series of small scale models. Historical perspectives are presented along with the effects of available materials and technology on structural possibilities. 3 seminars. Prerequisite: Graduate standing in Architecture.

**ARCE 523 Seismic Design for Architects (3)**

Introduction to the earthquake resistant design of buildings. Observed behavior of buildings during earthquakes. Recent developments of seismic design procedures, provisions, and building codes. Influence of architectural form on seismic response. 3 lectures. Prerequisite: Graduate standing in Architecture.

## **ARCH—ARCHITECTURE**

**ARCH 102, 103 Environmental Design Fundamentals (2) (2)**

Continuation of EDES 101. Development of abilities in environmental perception, techniques for analysis of the built environment, creative problem solving techniques and graphic communication skills. 2 laboratories. Prerequisite: EDES 101 or consent of department. To be taken concurrently with EDES 110.

**ARCH 106 Materials of Construction (3)**

Use and application of construction processes and materials. 3 lectures.

**ARCH 121 Introduction to Architectural Graphics (3)**

Basic techniques used in graphic communications in the environmental design field. Orthographic, isometric projections, elementary perspective, shades, shadows, value, contrast. 3 laboratories. Prerequisite: EDES 110 or consent of instructor.

**ARCH 202 Creative Problem-Solving (3)**

Techniques for stimulating creative behavior applied to general and environmental problems. Development of problem-solving and decision-making skills and knowledge. 3 lectures.

**ARCH 204 Architectural Theory (3)**

Theories of architectural design. 3 lectures. Prerequisite: EDES 101.

**ARCH 208, 209 Architectural Design Basics (2) (2)**

Introduction to the elements and theories of the environmental and architectural design processes. 2 laboratories. Prerequisite: ARCH 121.

**ARCH 213, 214, 215 Advanced Delineation (2) (2) (2)**

Development of proficiency in architectural presentation. Projects and critiques. 2 laboratories. Prerequisite: EDES 112.

**ARCH 217 History of Architecture (2)**

Overview of the history of world architecture involving its beginning and tracing stylistic manifestations in various cultures including the contemporary scene. 2 lectures. Prerequisite: ENGL 114.

**ARCH 218 History of Architecture (2)**

Architectural developments from 1750 until World War I including neoclassicism, various revivals, technological innovations, arbitrary searches for new forms, and design responses to evolving sociological phenomena. 2 lectures. Prerequisite: ENGL 114.

**ARCH 219 History of Architecture (2)**

Architectural design theories and practices from World War I to the present including the Bauhaus, de Stijl, International Style, Facist ideologies, Regionalism, post World War II amalgamations of twentieth century idioms, and recent reactions to contemporary standardization. 2 lectures. Prerequisite: ENGL 114.

**ARCH 221 Introduction to Environmental Design Science (2)**

Introduction to environmental sciences and their impact on man's physical structures. Influence of light, sound, thermal conditions and solar energy on buildings and community design. Energy conservation design factors. 2 lectures. Prerequisite: PHYS 131, PHYS 132, PHYS 137.

**ARCH 231, 232 Architectural Practice (3) (3)**

Introduction to building methods and processes and the construction documents used as communication medium. 3 laboratories. Prerequisite: ARCH 106, EDES 112, or consent of instructor.

**ARCH 234 Architectural Practice (6)**

Covers the same content as in ARCH 231, 232. Primarily for transfer students. Partial credit may be granted. 6 laboratories. Prerequisite: ARCH 106, EDES 112, or consent of instructor.

**ARCH 237 Photographic Presentation (2)**

Photographic and presentation techniques applicable to architectural subjects. For students in the School of Architecture and Environmental Design. 1 lecture, 1 laboratory. Prerequisite: EDES 110, ART 221 or equivalent.

**ARCH 240 Additional Architectural Laboratory (1-2)**

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

**ARCH 245 Urban Design in Architecture (3)**

Design role of the urban architect. Economic, environmental and technological forces impacting on architectural practice in urban areas. 3 lectures. Prerequisite: ENGL 114.

**ARCH 251, 252, 253 Architectural Design Fundamentals (3) (3) (3)**

Continuation of ARCH 103. Development of concepts pertaining to architectural form, space, structure, and organization. Consideration of function, site, climatic forces, and contextual issues which shape the built environment. One designated field trip required. 3 laboratories. Prerequisite: ARCH 103, EDES 112 or equivalent.

**ARCH 270 Selected Topics (1-3)**

Directed group study of selected topics. Class schedule will list topic selected. Open to first-, second-, third-year students. Total credit limited to 6 units. 1 to 3 lectures.

**ARCH 302 Principles of Architectural Design (3)**

Basic theory of the art of architecture and its application in architectural design. 3 lectures. Prerequisite: ARCH 204.

**ARCH 307, 308, 309 Building Support Systems (2) (2) (2)**

Alternative energy systems and mechanical systems/equipment for the design of architectural spaces including design analysis, systems comparison, and cost benefit studies. 2 lectures. Prerequisite: EDES 250, ARCH 221.

**ARCH 310 Architectural Design Methods and Theories (4)**

Analysis of design process, methods of analysis, synthesis, and evaluation in design. Relation between methods used and theories of design. 4 lectures.

**ARCH 312 Home and Community Design (3)****GEB F.2.**

For students not majoring in architecture. Historical development of the home and city and the effect of location, climate, social and technological factors on homes and cities. Considerations and design methodology; furniture, landscape, and relation of home to community environment. 3 lectures.

**ARCH 317, 318, 319 History of Architecture (2) (2) (2)****All: GEB C.3.**

Periods of architecture covering ancient, medieval, and renaissance; philosophies and conditions which influenced them. 2 lectures. May be taken out of sequence. Prerequisite: ENGL 114.

**ARCH 341, 342, 343 Architectural Practice (2) (2) (2)**

Construction systems in masonry, steel, and concrete and combinations of these materials. Preparation of outline specifications. Production of design development drawings. 2 laboratories. May be repeated to 4 units per course. Prerequisite: ARCH 253, ARCH 232.

**ARCH 350 Computer Applications in Architecture (2)**

Applications of computer systems to large-scale data processing, analysis, optimization and evaluation of design program elements. 1 lecture, 1 activity. Prerequisite: EDES 250.

**ARCH 351, 352, 353 Architectural Design (5) (5) (5)**

Continuation of ARCH 253. Development and exploration of architectural theories, building systems, and design processes involved in creating appropriate architecture. 5 laboratories. Prerequisite: ARCE 223, ARCH 232, ARCH 253. Concurrent enrollment recommended in ARCH 341, ARCH 342, ARCH 343.

**ARCH 358 Prefabrication (2)**

History, theory and application of factory fabricated building systems. Materials and techniques, creative design by such methods. 1 lecture, 1 laboratory. Prerequisite: Third-year standing.

**ARCH 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**ARCH 401 Toward a Barrier-Free Environment (2)**

Designing for the disabled, physical and attitudinal barriers to environmental accessibility. Attitudes toward deviancy. Principles of normalization/mainstreaming. Legal, moral, and architectural aspects. 1 lecture, 1 activity. Prerequisite: Third-year standing in ARCH, LA, or CRP or consent of instructor.

**ARCH 407 Building Support Systems Laboratory (2)**

Application of preliminary quantitative design methods to the evaluation of alternative building support system solutions in the context of architectural design problems. 2 two-hour laboratories. Prerequisite: ARCH 307, ARCH 308, ARCH 309.

**ARCH 411 Climatic Determinants of Building Design (2)**

Influence of solar radiation and climatic conditions on siting and design of buildings. Architectural principles and energy conservation. 2 lectures. Prerequisite: PHYS 132, ARCH 309.

**ARCH 438 Advanced Photographic Presentation (2)**

Photographic and presentation techniques applicable to architectural subjects. 1 lecture, 1 laboratory. Prerequisite: EDES 110, ART 221 or equivalent, ARCH 237, or consent of instructor.

**ARCH 441, 442, 443 Professional Practice (2) (2) (2)**

Basic elements of architectural practice. Office organization, procedures, contracts, specifications, construction cost analyses and comprehensive client services. Professional ethics. 2 activities. Prerequisite: ARCH 343 and fourth-year standing.

**ARCH 446 The Small Scale Master Builder (4)**

Principles of practice as owner-designer-builder, selling or leasing products. Comparison with traditional practice. Potential income, constraints on design decisions, and ethics. Analysis of factors and methods relevant to such practice, including financing, taxes, accounting, market analysis, and development potential. Starting with little or no capital. 4 lectures. Prerequisite: Fourth-year standing.

**ARCH 451 Architectural Design (5)**

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multifunction singular buildings. Miscellaneous course fee required—see *Class Schedule*. 5 laboratories. Prerequisite: ARCH 307, ARCH 308, ARCH 309, ARCH 341, ARCH 342, ARCH 343, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

**ARCH 452 Architectural Design (5)**

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects. 5 laboratories. Prerequisite: ARCH 307, ARCH 308, ARCH 309, ARCH 341, ARCH 342, ARCH 343, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

**ARCH 453 Architectural Design (5)**

Continuation of ARCH 351, 352, 353. Problems of increasing architectural complexity involving the comprehensive integration of architectural theory, design processes, and building systems with emphasis placed on multibuilding, multifunctional projects in an urban context. 5 laboratories. Prerequisite: ARCH 307, ARCH 308, ARCH 309, ARCH 341, ARCH 342, ARCH 343, ARCH 351, ARCH 352, ARCH 353, ARCE 321, ARCE 322, ARCE 323.

**ARCH 458 Computer Graphics Applications in Architecture (2)**

Computer graphics techniques as they relate to applications in working drawings and design. 1 lecture, 1 activity. Prerequisite: EDES 250.

**ARCH 459 Advanced Computer Applications (2)**

Application computer programming in advanced areas of architectural applications with emphasis in integrated data processing techniques, office automation, computer aided design, graphics and office communication as pertaining to architectural practice. 1 lecture, 1 activity. Prerequisite: EDES 250.

**ARCH 463 Undergraduate Seminar (2) (CR/NC)**

Discussion and lectures on problems of practice in architecture. Professional ethics. Students present organized material on some subject of interest in architecture. 2 seminars. Prerequisite: Fourth-year standing in architecture. Credit/No Credit grading only.

**ARCH 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ARCH 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**ARCH 481 Architectural Design (5)**

Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 15 units with not more than 5 units in any one quarter. Miscellaneous course fee required—see *Class Schedule*. 5 laboratories. Prerequisite: ARCH 441, ARCH 442, ARCH 443, ARCH 451, ARCH 452, ARCH 453.

**ARCH 491, 492, 493 Design Project (2) (2) (2)**

Comprehensive architectural design project chosen by the student to challenge technical, creative, and organizational abilities. Project to involve community or field contact on a team basis. Construction or projects involving other disciplines encouraged. 2 laboratories. Prerequisite: Fifth-year standing.

**ARCH 501 Environmental Control Systems (3)**

Comparative analysis and evaluation of mechanical and electrical building systems in high-rise and special purpose low-rise buildings. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 510, 511 Environmental Design Methods (3) (3)**

Application of systematic, step-by-step procedures to rational and intuitive judgmental tasks. Methods for formulation, idea production, evaluation, and testing applied to planning, testing, design information systems, communication between designer and client, user participation in design, and other current topics. 511 focuses on specific problem area among topics and may be repeated up to 9 units. 3 lectures. Prerequisite: Consent of instructor.

**ARCH 513 Natural Architectural Lighting (3)**

Perception and awareness of light; natural light as generator of urban spaces and building forms. Principles of design in lighting fundamentals and techniques. 3 lectures. Prerequisite: Consent of instructor.

**ARCH 514 Artificial Architectural Lighting (3)**

Perception and awareness of light; artificial light as a design tool; the characteristics of artificial light sources; the use of artificial light to reinforce the architectural concept. Principles of design in lighting fundamentals and techniques. Independent project required. Architectural aesthetics stressed. 3 lectures. Prerequisite: Consent of instructor.

**ARCH 519 Theory of Architecture (3)**

Comparative analysis of the major historic influences which have contributed to the development of architectural design theories. 2 lectures, 1 seminar. Prerequisite: ARCH 319 or consent of instructor and graduate standing.

**ARCH 531 Habitability (3)**

Habitability standards and concepts significant for architectural design and practice. Behavioral analysis of habitats, facilities and urban systems. Design and development of structures and systems responsive to human needs. Habitability and environmental specifications, human factors, human engineering, behavioral sciences. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 532 Quantitative Methods in Architecture (3)**

Roles of research in environmental design analysis. Approaches to research, hypothesis testing, data banks, and information systems for design. Use of research findings in various decision-making systems. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 533 Architectural Programming (3)**

Information management in the design process. Techniques for gathering, analyzing, and transforming data for use as design information. Variety of approaches to pre-design planning. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 551 Architectural Design (5)**

Professional initiative and responsibility in integrating architectural design theory and practice with fields influencing the total environment. Building types considered as the coordinating factor. Total credit limited to 15 units with no more than 5 units in any one quarter. 5 laboratories. Prerequisite: Graduate standing.

**ARCH 561 Advanced Design (3)**

Continuation of ARCH 551. Advanced studies integrating architectural design theory and practice with fields influencing the shaping of the total environment. May be repeated for a total of 9 units. 3 laboratories.

**ARCH 563 Professional Seminar (2)**

Problems and topics in the field of the architectural profession. Seminar drawn upon expertise of visiting professionals in addition to topics presented by regular faculty and students. 2 seminars. Prerequisite: Graduate standing and consent of instructor.

**ARCH 580 Seminar in Theory of Architecture (3)**

Directed group study of selected topics in the theory of architecture for graduate students. Class schedule will list specific topics selected. May be repeated to 9 units. 3 seminars. Prerequisite: Consent of instructor.

**ARCH 598 Master's Design Project (3-6)**

Completion of an architectural design project demonstrating individual creative ability at an advanced level. May be repeated for a total of 9 units. 3 or 6 laboratories. Prerequisite: Consent of graduate adviser, consent of graduate committee, and ARCH 561.

**ARCH 599 Master's Thesis (3-6)**

Completion of a thesis embodying original research in an area of environmental design. May be for a total of 9 units. Prerequisite: Consent of graduate adviser, consent of graduate committee and ARCH 561.

**ART****ART 101 Fundamentals of Drawing (3)**

Analysis and practice in functional drawing, basic design, and study of form. Development of individual techniques. 3 activities.

**ART 104 Introduction to Art Materials (3) (Also listed as ED 104)**

Manipulation and experimentation with a wide variety of art media and techniques. Evaluation of expressive and design qualities in group and individual projects. 3 activities.

**ART 111 Introduction to Art (4)****GEB C.2.**

Designed to acquaint the non-art major with painting, sculpture, drawing, crafts, architecture, and printmaking. Development of vocabulary, analytic skills, and research techniques for the understanding of art objects. 4 lectures.

**ART 112 Survey of Western Art (3)****GEB C.2.**

History of major art movements in western civilization from Greek art to the present. Representative periods of western culture, such as the Classic tradition, the Middle Ages, the Italian Renaissance, the Renaissance in Northern Europe, Baroque and Rococo, Romanticism, Neo-Classicism and Modernism. 3 lectures.

**ART 131 2-Dimensional Design Fundamentals (3)**

Basic design theory in black, white and greys covering the visual elements and principles in two dimensions. 1 lecture, 2 activities.

**ART 132 Beginning Color Theory (3)**

Basic design color theory developed through exercises in hue, value and intensity. 1 lecture, 2 activities. Prerequisite: ART 131.

**ART 133 Color and Design (3)**

Advanced color problems in two-dimensional design theory covering compositional, optical and psychological aspects of visual communication. 1 lecture, 2 activities. Prerequisite: ART 131, ART 132.

**ART 134 3-Dimensional Design I (3)**

Research of form and material as it pertains to application of three-dimensional design concepts. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

**ART 135 3-Dimensional Design II (3)**

Further exploration of 3-dimensional forms and materials. Form and structure are studied using fabrication methods and assembly processes. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: ART 134 or consent of instructor.

**ART 141 Introduction to 3-Dimensional Materials (3)**

Exploration of materials including clay, metal, and wood with specific emphasis on design problem solving and execution. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

**ART 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

**ART 201 Intermediate Drawing (3)**

Development of additional drawing techniques with emphasis on form and composition. 3 activities. Prerequisite: ART 101.

**ART 204 Beginning Watercolor (3)**

Transparent watercolor painting. Course emphases: proper use of watercolor paper, brush techniques, pigment mixing, use of color, use of washes, wet-into-wet, indirect methods, composition and presentation. 3 activities. Prerequisite: ART 101.

**ART 208 Sculpture (3)**

Exploration of three-dimensional form through problems in modeling, casting, carving and techniques of assembly. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

**ART 211 Art History—Prehistoric through the European Middle Ages (4)**

Nature and development of outstanding works of art from ancient cultures in Europe, Egypt and the Eastern Mediterranean. Emphasis upon the study of painting, sculpture and related visual arts that coincide with historical background factors. 4 lectures.

**ART 212 Art History—European Renaissance through Baroque Eras (4)**

Studies concentrate upon significant visual expressions of the Renaissance and Baroque eras in painting, sculpture and architecture. Relevancy of historical background factors to art expression emphasized. 4 lectures. Prerequisite: ART 211 or consent of instructor.

**ART 213 Art History—European 18th and 19th Century Art (4)**

Painting, sculpture and the related visual arts culminating with Romanticism, Neoclassicism, and Realism. Historical factors and artistic leaders pertinent to art expression of these eras emphasized. 4 lectures. Prerequisite: ART 211 or ART 212 or consent of instructor.

**ART 221 Basic B/W Photography (3)**

Fundamental techniques in black and white photography. Mechanics of cameras and equipment, optics, composition, filters, subject content, developing, printing, and mounting. Understanding photographic principles, producing a quality continuous tone print, and print presentation. 2 lectures, 1 laboratory.

**ART 222 35mm Intermediate B/W Photography (3)**

Control of tonal range using 35mm cameras and available daylight illumination. Composition and visual communication. Assignments range from close-ups to architecture. Emphasis on professional quality enlargements. 2 lectures, 1 laboratory. Prerequisite: ART 221.

**ART 224 35mm Advanced B/W Photography (3)**

Advanced B/W photography using 35mm cameras. Artificial light including studio electronic flash, tungsten studio light, and hand strobe. Professional quality developing and printing. Includes portraiture, close-ups, product, and action. 2 lectures, 1 laboratory. Prerequisite: ART 221, ART 222 or consent of instructor.

**ART 228 35mm Color Slide Photography (2)**

Introductory nonlaboratory course in color slide photography featuring 35mm camera handling, slide film, indoor and outdoor photography, composition, slide presentation. 2 lectures.

**ART 230 Beginning Graphic Design (3)**

Basic terminology, studio skills, assembly methods, photographic reproduction processes, and specification for graphic designers. Familiarization with the various services available. 2 lectures, 1 laboratory. Prerequisite: ART 131, ART 132, ART 133.

**ART 242 Glassblowing (3)**

Techniques in the offhand process of working with glass from a furnace. Overview of glass history. Development of tools and forming processes studied while students develop 3-dimensional projects. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 activity.



**ART 243 Glassforming (3)**

Techniques in the processes of fusing, forming, and assembling glass. Introduction to the use of line, color, and texture related to glass as a transparent or opaque material. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities.

**ART 245 Ceramics (3)**

Ceramic processes with emphasis on design quality, hand building, and use of the potter's wheel. Sketchbook required. Design of single and multiple clay objects. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

**ART 250 Wood Design (3)**

Development of quality design in wood. Use of basic hand tools and processes. Design and completion of projects using fine hardwood. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

**ART 255 Jewelry Design (3)**

Nonferrous metal techniques including cutting, forming, soldering, and forging with emphasis on design and craftsmanship. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

**ART 301 Advanced Drawing (3)**

Development of advanced methods and techniques in the study of form and structure. Emphasis on problem solving. 3 activities. Prerequisite: ART 131 and ART 201.

**ART 302 Life Drawing I (3)**

Development of methods and techniques in the study of form and structure as it relates to human proportion and anatomy analysis. 3 activities. Prerequisite: ART 201.

**ART 303 Life Drawing II (3)**

Advanced problems in life drawing. Advanced methods and techniques in the study of the human form as it relates to proportion, anatomy analysis and composition. 3 activities. Prerequisite: ART 302.

**ART 304 Advanced Watercolor (3)**

Transparent watercolor painting. Design and composition of painting, use of drawing and advanced watercolor techniques. 3 activities. Prerequisite: ART 204.

**ART 305 Painting Techniques (3)**

Physical characteristics of painting media, creative understanding of pictorial space and color. 3 activities. Prerequisite: ART 101, or consent of instructor.

**ART 308 Sculpture (3)**

Advanced exploration of three-dimensional form through problems in modeling, casting, carving, and techniques of assembly. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: ART 208 or consent of instructor.

**ART 309 Illustration (3)**

Development of skills necessary for the rendering of editorial and advertising illustration. Brief historical survey of illustration, research, and conceptual development of illustration. 3 activities. Prerequisite: ART 201 and ART 301 or consent of instructor.

**ART 311 Art History—Modern Art (4)**

History of painting and sculpture from the French Revolution to World War I. Covers such major movements as Neo-Classicism, Romanticism, Impressionism, Post-Impressionism, Fauvism, Cubism, Expressionism, and Dada. 4 lectures. Prerequisite: ART 111 or ART 213.

**ART 312 Art History—Contemporary Art (4)****GEB C.3.**

History of major art movements and ideologies from Surrealism to the present. Major emphasis will be placed on developments in painting and sculpture after World War II. 4 lectures. Prerequisite: ART 311, a 200-level art history course or consent of instructor.

**ART 314 History of Photography: Images and Processes (4)****GEB C.3.**

Photography and significant photographers from the invention of the camera obscura to the present day. Development of the technology of photography in relationship to the images produced. Relationship of photography to other visual arts as well as its social and cultural impact. 4 lectures.

**ART 316 Design History (3)**

Survey of design history from the Russian avant-garde to the present. Emphasis placed on Constructivism, Streamlining, and development of the Modern Movement in design. 3 lectures. Prerequisite: ART 211 and ART 212 or ART 213 for Art majors; junior standing for all other students.

**ART 321 Creative B/W Photography (4)**

Based upon black and white advanced techniques. High contrast, Sabbatier, bas-relief, tone line, texture screens, other abstract techniques. Emphasis placed on creative self-expression, application of techniques to give greater visual impact. 2 lectures, 2 laboratories. Prerequisite: ART 224.

**ART 322 Color Photography I, Negative (3)**

Fundamental techniques in color photography. Theory of color, visual concepts, exposing, and processing color negatives, printing from color negatives, finishing and presentation. Studio electronic flash and available light. 2 lectures, 1 laboratory. Prerequisite: ART 224.

**ART 323 Color Photography II, Positive (3)**

Applied techniques in exposing and processing 35mm color transparencies; color printing from color slides; finishing and presentation. Emphasis on analyzing color slides to produce quality color prints; both documentary and creative assignments. 2 lectures, 1 laboratory. Prerequisite: ART 224, ART 228, ART 322 or consent of instructor.

**ART 325 4x5 Camera Techniques, B/W (3)**

Basic techniques using 4x5 view cameras. Architecture, landscapes, portraiture, and other outdoor subjects used to help the student master the use of large format cameras. Other topics include exposure techniques, perspective, and sharpness correction, lighting and composition. Sensitometric approach to B/W film development and print quality emphasized. 2 lectures, 1 laboratory. Prerequisite: ART 323 or consent of instructor.

**ART 326 4x5 Camera/Commercial (3)**

Professional techniques with large format cameras. Outdoor and studio photography presented using B/W film and color transparencies. Topics include studio lighting for glass and metal, copying, interiors, and product photography. 2 lectures, 1 laboratory. Prerequisite: ART 322, ART 323, ART 325 or consent of instructor.

**ART 327 Portraiture I, B/W (3)**

Studio and environmental portraiture. Emphasis on light ratios/patterns; posing; personality portrayal. Retouching of film and print. Small format cameras. 2 lectures, 1 laboratory. Prerequisite: ART 224.

**ART 331, 332, 333 Graphic Design (3) (3) (3)**

Investigation and experimentation in typography, symbology, and design. Emphasis on lettering skills, visual problem solving and development of corporate identity systems. 3 activities. Prerequisite: ART 309 or consent of instructor.

**ART 341 3-Dimensional Processes (4)**

Methods for studio or industrial craftsmakers with consideration to design integrity, material use and product quality. Each schedule listing will have an area and topic subtitle. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 activities. Prerequisite: ART 300-level in same area or consent of instructor.

**ART 342 Cold Forming Techniques for Glass (3)**

Techniques focusing on the various processes of controlling glass forms through engraving, beveling, cutting and polishing. Assembly techniques including adhesives and mechanical joints. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: ART 242, or ART 243 or consent of instructor.

**ART 343 Glassforming (3)**

Selected advanced topics in glassforming: primarily casting, sheet rolling, and press moulding. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: ART 242 or ART 243 or consent of instructor.

**ART 345 Ceramic Form Design (3)**

Development of hand, wheel, mold, jigger, and press forming skills. Design of single and multiple forms. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: ART 245 or consent of instructor.

**ART 346 Ceramic Surface Design (3)**

Use of clay, slip, engobe, glaze and firing processes. Contemporary craftmaker's skills are developed through practice of historic and industrial techniques. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: ART 245 or consent of instructor.

**ART 348 Chemistry of Glasses (2)**

Review of basic chemical principles, defining physical properties of the glassy state, and a description of raw materials and colorants used. Formulate clear and opaque glass and modify the LEC (Linear Expansion Coefficient) of each recipe to assure compatibility. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: ART 242, ART 243, CHEM 106 or consent of instructor.

**ART 349 Ceramic Glazes (2)**

Historical background, chemistry review, raw materials, colorants, glaze calculations, construction of test tiles, techniques of glaze application and firing. Emphasis on notebooks and presentation of final project. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: CHEM 106 and ART 346 or consent of instructor.

**ART 355 Metalsmithing (3)**

Intermediate fabrication. Investigation of surface design techniques for nonferrous metals including etching, enameling, mokume, inlay, and various texturing processes. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: ART 255 or consent of instructor.

**ART 356 Jewelry Casting (3)**

Introduction to casting for the jeweler with emphasis on lost wax techniques including design, wax working, casting and finishing. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: ART 255 or consent of instructor.

**ART 357 Metalsmithing (3)**

Advanced design concepts applied to metalsmithing. Exploration of techniques used in creating holloware forms with emphasis on raising. Quality design concepts expected. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: ART 255 or consent of instructor.

**ART 382 Studio Production (3)**

Design development and production of a series or edition of works. *Class Schedule* will list subtitle, i.e., ceramics, glass, metal, watercolor. Miscellaneous course fee may be required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: 6 units of 300-level ART laboratory classes or consent of instructor.

**ART 400 Special Problems for Advanced Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Senior standing and consent of instructor.

**ART 424 Multi-Media Photography (4)**

Multi-media presentation, synchronizing color slides, music and narration. Contemporary, creative photography techniques applied. Creative seeing and interpretation that communicates to the viewer. 2 lectures, 2 laboratories. Prerequisite: ART 323 or consent of instructor.

**ART 426 Illustration Photography I, B/W (3)**

Principles of lighting and design as applied to subjects and small product studio photography. 35mm and 2¼ cameras used. Emphasis on creative problem solving, constructing scene and lighting to produce quality image. 2 lectures, 1 laboratory. Prerequisite: ART 224, ART 323

**ART 427 Illustration Photography II, Color (3)**

Applied principles of design and color to produce a photograph that sells an idea, product, or service. 35 mm and 2¼ cameras used. Emphasis on thinking, planning, interpreting, and presenting an idea photographically. 2 lectures, 1 laboratory. Prerequisite: ART 426.

**ART 428 Commercial Photography (4)**

Professional photographic techniques using large and small format cameras, color and B/W materials. Incorporates personal style. Emphasis on commercial and illustrative applications in studio and on location. Portfolio quality prints. 2 lectures, 2 laboratories. Prerequisite: ART 326, ART 426, ART 427.

**ART 431, 432, 433 Advanced Graphic Design (3) (3) (3)**

Advanced problems in advertising, layout, and package design. Awareness of designer/client relationships within the different design professions. 3 activities. Prerequisite: ART 333 or consent of instructor.

**ART 445 Advanced Ceramics (3)**

Clay-working processes with controlled forms and surfaces. Development of personal design philosophies as a basis for form and statement criticism. Drawing, forming and firing techniques emphasized. Design and execution of clay forms. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: ART 345 or ART 346 or consent of instructor.

**ART 446 Advanced Ceramics (3)**

Surface development on pottery or sculpture. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: ART 346 or consent of instructor.

**ART 460 Professional Practices (2)**

Professional practices in the art and design field, legal and ethical questions, taxes, contracts, fees and copyrights. Current job opportunities, resumé and portfolio preparation with visiting professionals. 2 activities. Prerequisite: Advanced standing in major or consent of instructor.

**ART 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Minimum of 120 hours time. Results presented in a formal report. Prerequisite: Senior standing and ART 460.

**ART 463 Undergraduate Seminar (2)**

Analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: Senior standing.

**ART 464 Graphics and Animation Techniques for Microcomputers (3)**

Original and available software to investigate graphics generation and realtime animation techniques. Topics include BASIC vs. assembly language; brush painting; page flipping; color graphics; sound, music and speech; educational and commercial applications; marketing. 3 lectures. Prerequisite: CSC 110 or CSC 410 and CSC 207 or consent of instructor.

**ART 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ART 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

## ASCI—ANIMAL SCIENCE

### ASCI 111 Market Beef Production (3)

Breeds, market classes, and grades of beef cattle. Selection of feeder cattle. Management practices in purchasing and fattening cattle using farm grown feeds. Cattle feeding operations carried on at the campus. Marketing of beef cattle. 3 lectures.

### ASCI 112 Elements of Swine Production (3)

History, development and importance of swine industry. Types, breeds, market classes and grades of swine. Basic principles and practices of swine feeding and management. 3 lectures.

### ASCI 113 Elements of Sheep Production (3)

Survey of the types of sheep operations in California. Breed study, market classes, and grades identification. Commercial fattening of lambs in dry lot and irrigated pasture programs. Calendar of operations for the various types of sheep enterprises. 3 lectures.

### ASCI 114 Elements of Horse Production (3)

Status of the horse industry. Breeds of horses and their uses. Anatomy and parts of the horse. Unsoundnesses, ailments and their treatments. Early history of the horse. 3 lectures. Concurrent enrollment in ASCI 244 recommended.

### ASCI 131 Basic Equitation (3)

Grooming, saddling, bridling, mounting, seat and hands. Horsemanship both under saddle and bareback. Basic care of the horse. Types of horse gear and equipment. Designed to teach basic riding to students with no previous experience. Advanced sign-up with instructor required. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

### ASCI 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### ASCI 202 Feeds and Feeding (3)

GEB F.2.

Simple use of food nutrients. Identification and classification of feeds for each class of livestock. Digestion and utilization of feeds. Feeding standards and computation of simple rations for livestock. Economy in feeding and purchasing feeds by nutritive values. 3 lectures. Concurrent enrollment in ASCI 240.

### ASCI 226 Livestock Evaluation (3)

Utilization of objective and subjective estimation measures in establishing economic worth of domestic animals of the three meat animal species and horses. 1 lecture, 2 laboratories.

### ASCI 229 Range Management (4)

Characteristics of rangeland, identification of range plants, management practices to maintain range resources and increase production of forage and livestock. 3 lectures, 1 laboratory. Prerequisite: SS 121, ASCI 111 or ASCI 230, a botany or crops science course.

### ASCI 230 General Animal Science (4)

GEB F.2.

Role of animal agriculture in food production and human nutrition. Discussion of breeds, types of enterprises, nutrition, reproduction and management of beef cattle, sheep and swine. Commentary on the horse as a recreational animal. Credit not allowed for animal science majors. 3 lectures, 1 laboratory.

### ASCI 234 Horseshoeing (2)

Fundamentals of horseshoeing, anatomy and physiology of the horse's foot, pastern, and legs. Trimming feet, fitting and nailing shoes. Normal shoeing, corrective shoeing. 1 lecture, 1 laboratory combined.

### ASCI 240 Applied Feeds and Feeding (2)

Introduction to feedstuffs, identification and quality evaluations. Proximate analysis, digestibility and energy values of feeds. Mechanics of ration formulation and feeds selection based on nutrient content and market values for the various species of domestic livestock. 1 lecture, 1 activity. Concurrent enrollment in ASCI 202.

**ASCI 241 Applied Beef Cattle Practices (2)**

Application of operational practices in the purchasing, management, and marketing of beef cattle. Equipment, preventive veterinary practices, live animal evaluation, performance records, carcass evaluation, and ranch evaluation. 1 lecture, 1 activity.

**ASCI 242 Applied Swine Management Practices (2)**

Application of operational practices in the management and merchandising of swine. Housing and equipment, routine veterinary practices, live animal evaluation, performance evaluations, farrowing and post-farrowing practices, and carcass appraisal. 1 lecture, 1 activity.

**ASCI 243 Applied Sheep Management Practices (2)**

Flock management; sheep handling techniques; breed evaluation; preparation for exhibition; internal and external parasite control; tagging, shearing, foot trimming; selection; culling and identification. Marking techniques. Wool grading and judging. Market lamb and carcass evaluation. 1 lecture, 1 activity.

**ASCI 244 Applied Horse Practices (2)**

History and location of horse unit facilities and breeds maintained. Common knots, proper techniques in safely catching, leading, grooming, and restraining horses. Evaluation of desirable and faulty conformation. Preventive health program. Determining the age of a horse by dentition. Pedigree analysis. 1 lecture, 1 activity. Prerequisite or corequisite: ASCI 114 recommended.

**ASCI 260 Preparation of Livestock for Shows and Sales (2)**

Techniques, equipment and knowledge necessary in order to properly condition, groom, and present livestock for evaluation and merchandizing. 2 laboratories.

**ASCI 302 Applied Animal Nutrition (3)**

Feedstuff evaluation and analysis. Advancements in feedstuff evaluation and application to ration formulation. Principles and practices in livestock ration formulation. Linear programming principles as applied to computer formulated rations. 2 lectures, 1 laboratory. Prerequisite: ASCI 202, CHEM 326.

**ASCI 304 Animal Breeding (3)**

Application of genetics to the improvement of farm animals. Improving production through a study of mating systems including outbreeding, inbreeding, selection techniques, performance testing and evaluating, herd records, indexing and progeny testing. Setting up and organizing improved breeding programs using modern technique and equipment. 3 lectures. Prerequisite: BIO 303.

**ASCI 311 Commercial Beef Management (3)**

Care and management of a breeding herd of commercial cattle in California. Range and farm lands suited to beef production. Factors affecting cost of production. Improvement of breeding herd. Trends in the industry. 3 lectures.

**ASCI 312 Swine Management (3)**

Management practices involved in commercial and purebred swine enterprises. Methods of production and marketing, performance testing programs and carcass evaluation techniques. Nutritional requirements, rations, diseases and parasites, facilities and equipment. 3 lectures. Prerequisite: ASCI 112, ASCI 202.

**ASCI 313 Sheep Management (3)**

Managerial practices for both commercial and purebred sheep enterprises. Performance testing and carcass evaluation techniques. Preparation and merchandising of the wool clip. Introduction to wool processing. 3 lectures. Prerequisite: ASCI 113.

**ASCI 323 Beef Husbandry (4)**

Purebred cattle business including selection of foundation stock, herd bulls; breeding programs; pedigrees; facilities and equipment; feeding breeding herd, sale cattle, show cattle; marketing purebred cattle; and general management problems. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory.

**ASCI 326 Advanced Livestock Evaluation (2)**

Application of deductive and inductive logical processes in appraising the relative merit of individual animals within a group sample. Oral expression of the selection rationale. 2 laboratories. Prerequisite: ASCI 226.

**ASCI 333 Horse Husbandry (4)**

Management of the breeding farm. Farm layout. Inheritance, pedigrees, diseases, breeding problems, nutrition, study of estrous cycles, and servicing the mare. Handling stallions. Sale preparation. Breeding and feeding records, office procedure, selection of breeding stock. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: ASCI 114, ASCI 244.

**ASCI 334 Feed Mill Operation (4)**

General operation of a feed mill including a survey of the industry, buying, storing, grinding, weighing, mixing, packaging, handling, and delivery of formula feeds. Flow of materials, preventive maintenance and safety in a mill. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: ASCI 202, ASCI 240.

**ASCI 341 Evaluation and Management of Livestock Production Tests (2)**

Organization and rationale for livestock tests, health and nutritional management, structural and reproductive soundness evaluation, administrative functions, and accumulation and analysis of performance information. 1 lecture, 1 laboratory. Prerequisite: Upper division status and consent of instructor.

**ASCI 400 Special Problems for Advanced Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Prior consent of department head.

**ASCI 401 Reproductive Physiology (4)**

Reproductive efficiency of farm animals. Anatomy and physiological factors involved in reproduction. Male and female systems, pregnancy, estrual behavior, semen collection and evaluation, artificial insemination, pregnancy testing, and hormone therapy. 3 lectures, 1 laboratory. Prerequisite: VS 123.

**ASCI 402 Animal Nutrition (4)**

Metabolism of proteins, carbohydrates, fats, minerals, and vitamins. Relationship of proper nutrition to livestock production. 3 lectures, 1 laboratory. Prerequisite: ASCI 302, CHEM 328.

**ASCI 404 Applied Animal Genetics (3)**

Genetic improvement of economic traits in farm animals. Application of advanced genetic concepts to animal improvements through analysis of performance data. 2 lectures, 1 laboratory. Prerequisite: ASCI 304.

**ASCI 434, 435 Specialized Horse Enterprises (3) (3)**

Early schooling of the young horse through advanced training. Use of the snaffle bit, hackamore, half-breed and Spanish bits. Gentling and ground work. Training in collection, turning, backing, leads, trailer loading, rope work, cattle work. Advanced sign-up with instructor required. 1 lecture, 2 laboratories. Prerequisite: ASCI 333 or appropriate experience.

**ASCI 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**ASCI 463 Undergraduate Seminar (2)**

Major developments in the chosen field of the student. Discussion of new developments, policies, practices, and procedures. Each individual is responsible for the development and presentation of a topic in the chosen field. 2 seminars.

**ASCI 470 Selected Advanced Topics (1–3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ASCI 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**ASCI 581 Graduate Seminar in Animal Production (3)**

Current findings and research problems in the field and their application to the industry. 3 seminars.

**ASTR—ASTRONOMY AND ASTROPHYSICS****ASTR 101 Introduction to the Solar System (3)****GEB B.1.a.**

Descriptive astronomical properties of the earth, moon, other planets and their satellites. Comets, asteroids and other members of the solar system. Theories of the formation of the solar system. Opportunities for telescope observations of the moon and planets. Not open to students who have completed or are taking ASTR 301, or PHYS 132. 3 lectures.

**ASTR 102 Introduction to Stars and Galaxies (3)****GEB B.1.a.**

Descriptive astronomical properties of the sun, stars, galaxies, and interstellar material. Expanding universe and cosmological models. Opportunities for telescope observations and star identification. Not open to students who have completed or are taking ASTR 302, or PHYS 132. ASTR 101 is not a prerequisite. 3 lectures.

**ASTR 301 The Solar System (3)**

Quantitative and descriptive properties of the solar system including the physics of the planets, their satellites, comets and interplanetary media; possible origins of the solar system. 3 lectures. Prerequisite: PHYS 132 or PHYS 123. Not open to students who have completed ASTR 101.

**ASTR 302 Stars and Galaxies (3)**

Quantitative and descriptive properties of the stars, galaxies and interstellar media; including stellar structure and evolution, structure and make-up of galaxies and cosmological models. 3 lectures. Prerequisite: PHYS 132 or PHYS 123. ASTR 301 is not a prerequisite. Not open to students who have completed ASTR 102.

**ASTR 303 Cosmology and General Relativity (3)**

Introduction to the basic ideas of general relativity. Einstein's law of gravity, curved space and its application to relativistic models of the universe, black holes, and pulsars. Big Bang and Steady State theories of the expanding universe. Relevant observational evidence included. 3 lectures. ASTR 302 is not a prerequisite. Prerequisite: PHYS 133.

**BACT—BACTERIOLOGY****BACT 221 General Bacteriology (4)****GEB B.1.b.**

Morphology, metabolism, classification and identification; bacteriology of air, soil, water, and foods with applications to industry, agriculture, medicine, and public health. 2 lectures, 2 laboratories. Prerequisite: One quarter of chemistry.

**BACT 224 General Microbiology I (4)**

Functional anatomy and physiology of prokaryotic and eukaryotic microorganisms. 2 lectures, 2 laboratories. Prerequisite: BOT 121 or ZOO 131 and organic chemistry.

**BACT 225 General Microbiology II (4)**

Systematics, genetics, and ecology of microorganisms with emphasis on prokaryotes; a survey of the microbial groups. 2 lectures, 2 laboratories. Prerequisite: BACT 224.

**BACT 322 Dairy Bacteriology (4)****GEB B.1.b.**

Advanced course for practical work demonstrating the domestic and industrial importance of microorganisms involved in milk and dairy products; milk, milk powders, fermented milks, evaporated and condensed milks, butter, cheese, cheese starters, and ice cream. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.



**BACT 333 Industrial Microbiology (4)**

**GEB B.1.b.**

Industrial application of microorganisms in the production of chemicals related to the food and pharmaceutical industries; consideration of environmental sanitation in industrial processes. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224, CHEM 326.

**BACT 342 Sanitary Microbiology (4)**

**GEB B.1.b.**

Principles of disease prevention and control. Water-, food-, and air-borne microbial contaminations and epidemiology of ensuing diseases. Laboratory techniques in detection and control of wastes and disease-causing microorganisms. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

**BACT 402 General Virology (3)**

Virus-host interactions. Structure and function of viruses as obligate intracellular parasites of microbes, plants, and animals. Epidemiology, pathogenesis, prophylaxis, chemotherapy, and manipulation of viruses which parasitize man. 3 lectures. Prerequisite: BACT 224. Recommended: One quarter of college biochemistry.

**BACT 403 General Virology Laboratory (2)**

Methods of culture, characterization and identification of viruses, with emphasis on viruses parasitic in man and animals. 2 laboratories. Prerequisite or concurrent: BACT 402 and consent of instructor.

**BACT 421 Food Microbiology (4)**

Physiological activities of microorganisms involved in the preparation, preservation, deterioration and toxicity of foods and related products. Sanitary and public health implications. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224. Recommended: CHEM 326.

**BACT 423 Medical Microbiology (4)**

Microorganisms as agents of disease in man. Epidemiology, host-parasite relationships, and principles and procedures for laboratory diagnosis of human diseases. 2 lectures, 2 laboratories. Prerequisite: BACT 225. Recommended: ZOO 426.

**BACT 424 Bacterial Cytology and Physiology (4)**

Cellular structure and life processes of bacteria; chemical composition, growth and metabolism. General biological implications. 3 lectures, 1 laboratory. Prerequisite: BACT 225 and CHEM 326. Recommended: One quarter of biochemistry.

**BACT 430 Medical Mycology (4)**

Morphology, physiology, infectivity, and immunogenicity of fungi pathogenic for man and other mammals. Host-parasite interactions. Demonstration and isolation of pathogenic fungi from clinical material. 2 lectures, 2 laboratories. Prerequisite: BACT 423.

**BACT 436 Microbial Ecology (4)**

Distribution and interrelationships of marine, fresh water, and terrestrial protists. Microorganisms as biological, biochemical, and geological agents and the role they play in the cycles of nature. 2 lectures, 2 laboratories. Prerequisite: BACT 221 or BACT 224.

## BIO—BIOLOGY

**BIO 100 Orientation to Biological Sciences (1) (CR/NC)**

Career opportunities in the biological sciences, designing a career goal and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading only. 1 lecture.

**BIO 101 General Biology (3)**

**GEB B.1.b.**

Principles of cellular biology, heredity, ecology, and evolution, with emphasis on their relationship to human affairs. Not open to students who have completed BOT 121 or ZOO 131. 3 lectures.

**BIO 102 Plant Biology (3)**

**GEB B.1.b.**

Structural and functional aspects of plants, with emphasis on seed producers. Not open to students who have completed BOT 121. 3 lectures. Prerequisite: BIO 101.

**BIO 103 Animal Biology (3)****GEB B.1.b.**

Structural and functional aspects of animals, with emphasis on man. Not open to students who have completed ZOO 131. 3 lectures. Prerequisite: BIO 101.

**BIO 105 General Biology Laboratory (1)****GEB B.1.b.**

Observations and experiences involving basic principles in the biological sciences. Emphasis on the diversity of living systems; cell structure and function; interaction of the environment with populations and communities; natural selection and evolution. 1 laboratory. Concurrent or previous enrollment in BIO 101.

**BIO 127 Natural History: Animal Adaptations (3)****GEB B.1.b.**

Interpretation of structural and functional adaptations of animals; emphasis on phenomena readily observed in the field. Laboratory exercises emphasize insects as examples. 2 lectures, 1 laboratory.

**BIO 128 Natural History: Animal Communities (3)****GEB B.1.b.**

Examination of local biotic communities, emphasizing identification and natural history of the animals which inhabit them. Field experience in local communities. 2 lectures, 1 laboratory, 2 Saturday field trips. Recommended: BIO 127.

**BIO 129 Natural History: Plant Communities (3)****GEB B.1.b.**

Principles of field biology and ecology; laboratory and field study of land and freshwater plant communities, emphasizing identification of plants inhabiting them. 1 lecture, 2 laboratories, Saturday field trips. Recommended: BIO 128.

**BIO 220 Physiology and Biological Adaptation (4)****GEB B.1.b. and E.2.**

Physiological principles with integration of principles of adaptation of life processes among living organisms. 4 lectures. Prerequisite: Completion or simultaneous enrollment in college level chemistry.

**BIO 253 Orientation to the Health Professions (1) (CR/NC)**

Participation in hospital activities and mental health services. Intended for medically oriented students. Total credit limited to 6 units with a maximum of 1 unit per quarter. Offered only on Credit-No Credit basis. 1 activity. Prerequisite: Instructor's consent and one quarter of college chemistry and ZOO 131.

**BIO 255 Microtechnique (2)**

Methods of preparing plant and animal tissues for microscopic study with emphasis on paraffin embedding techniques and staining. 2 laboratories. Prerequisite: BOT 122 or ZOO 132.

**BIO 300 Biology of Cancer (2)**

Molecular, cellular and immunological aspects of cancer. Types of cancer and modes of treatment. Environmental, psychological and sociological implications. Cancer research. Not for Biology credit for majors in Biological Sciences. 2 lectures.

**BIO 301 Human Ecology (3)****GEB B.1.b.**

Examination of the ways in which man is dependent on his environment, his ability to modify it, and the results of such modification. 3 lectures. Prerequisite: One quarter of biological science.

**BIO 302 Human Genetics (3)****GEB B.1.b.**

Basic principles of human inheritance. Transmission of genetic traits, chromosomal anomalies of humans, gene action, mutations and mutagenic agents, eugenics, and principles of genetic counseling. 3 lectures. Prerequisite: One course in college biology (preferably BIO 101 or ZOO 131).

**BIO 303 Genetics (3)****GEB B.1.b.**

Principles of heredity and variation. 3 lectures. Prerequisite: One quarter of college biology and one quarter of college mathematics.

**BIO 304 Molecular Genetics (3)**

Introduction to the structures, functions, and regulatory mechanisms of nucleic acids in biological systems. 3 lectures. Prerequisite: One quarter of college biology. Recommended: BIO 303 and one course in biochemistry.

**BIO 311 Radiation Biology (3)****GEB B.1.b.**

Review of production and characteristics of non-ionizing and ionizing radiation; interaction and effect of radiation on living cells, tissues, organs, and organisms; introduction to use of radioisotopes; radiation protection and dosimetry; impact of nuclear energy on the biological world. 3 lectures. Prerequisite: CHEM 122 or CHEM 128 and one of the following: BIO 101, BOT 121, ZOO 131.

**BIO 312 Introduction to Scanning Electron Microscopy (2)**

Structure, functioning and techniques of applying SEM to the study of biological and nonbiological materials. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 activity.

**BIO 315 Evolution (3)**

Modern concepts of evolutionary mechanisms. 3 lectures. Prerequisite: BIO 303.

**BIO 321 Biological Instrumentation (3)**

Theory and operation of instruments commonly used in biological investigation. 1 lecture, 2 laboratories. Prerequisite: BOT 121 or ZOO 131.

**BIO 325 General Ecology (3)****GEB B.1.b.**

Interrelationships between plants and animals and their environment in terrestrial, marine, and freshwater situations. 2 lectures, 1 laboratory. Prerequisite: BIO 129 or both BOT 122 and ZOO 132.

**BIO 328 Marine Biology (4)**

Biological and environmental studies of marine organisms, with emphasis on their economic importance. 2 lectures, 2 laboratories. Prerequisite: BOT 122 and ZOO 133, or consent of instructor.

**BIO 330 Biology of Aging (3)**

Theories of aging, the biological principles involved, and the current status of research in the field. 3 lectures. Prerequisite: College-level course in biology. Recommended: An introductory course in chemistry.

**BIO 334 Freshwater Ecology (3)**

Physical, chemical, and biological factors of freshwater environments as they relate to freshwater organisms. 2 lectures, 1 laboratory. Prerequisite: One year college biology, one quarter college chemistry.

**BIO 342 Computer Applications in Biology (3)**

Application, use and simple modification of computer programs for biological studies. 2 lectures, 1 laboratory. Prerequisite: Junior standing, completion of mathematics requirement, and CSC 101 or CSC 110.

**BIO 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**BIO 415 Biogeography (3)**

Plant and animal distribution patterns in relation to past and present physical and biotic factors; continent by continent survey of biogeography with major emphasis on North America. 3 lectures. Prerequisite: BIO 325.

**BIO 423 General Cytology (4)**

Detailed study of the structure and function of animal and plant cells. 3 lectures, 1 laboratory. Prerequisite: ZOO 131 and BOT 121 and organic chemistry or biochemistry.

**BIO 424 Organizing and Teaching Biological Sciences (3)**

Objectives, content, techniques, material, and recent trends of successful instruction in secondary school biology. 3 lectures. Prerequisite: Consent of instructor.

**BIO 425 Basic Electron Microscopy I (3)**

Biological applications of electron microscopy including techniques of specimen preparation, design of experiments, interpretation of results and limitations. 1 lecture, 2 laboratories. Prerequisite: ZOO 131, BOT 121, BIO 423 or consent of instructor.

**BIO 426 Cytogenetics (4)**

Cytological basis of genetics. Correlation between genetic principles and chromosome behavior by studying mitotic and meiotic cells. Cytological study of hybrids, polypoids and chromosomal aberrations in plants and animals. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

**BIO 431 Physiology I: General (4)**

Functioning, control, and integration of physiological phenomena at various levels from cell to organism. 2 lectures, 2 laboratories. Prerequisite: CHEM 326; BOT 122 or ZOO 132.

**BIO 437 Marine Resources (3)**

Resource status of present and potential biological marine resources of the sea. Identification, life history, ecology, culture and economics of pertinent organisms. 3 lectures. Prerequisite: BOT 122 and ZOO 133.

**BIO 442 Biometry (4)**

Design of biological experiments with emphasis on sampling methods, data collection, mensuration, and analysis of field and laboratory data. 3 lectures, 1 laboratory. Prerequisite: One year of biology and STAT 212 or STAT 321.

**BIO 461, 462 Senior Project (3) (2)**

Projects are selected from typical problems which graduates may meet in areas of their future employment. Results are presented in written reports. Minimum 150 hours total time.

**BIO 463 Undergraduate Seminar (2)**

Study and discussion of recent developments in the field of biology. 2 seminars. Prerequisite: Senior standing.

**BIO 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**BIO 471 Selected Advanced Laboratory (1-2)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. Total credit limited to 4 units. 1 to 2 laboratories. Prerequisite: Consent of instructor.

**BIO 500 Individual Study (1-3)**

Advanced study planned and completed with the approval of and under the direction of a member of the department faculty. A written scholarly presentation of the results of each BIO 500 project must be included in the graduate student's departmental file. Not open for credit to students in the thesis program. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of the Graduate Coordinating Committee.

**BIO 501 Cellular Biology (3)**

Consideration of recent studies on the energetics, synthesis, regulation, genetics, transport, movements, reproduction, and differentiation of cells. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

**BIO 502 Biology of Organisms (3)**

Consideration of recent advances in the knowledge of organisms; their morphology, systems of maintenance, organization and integration, responsiveness and behavior, development and reproductive processes. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

**BIO 503 Population Biology (3)**

Consideration of current theory and practice in evolution, genetics, ecology and systematics of organisms. 2 seminars, 1 activity. Prerequisite: Graduate standing and/or consent of instructor.

**BIO 515 History of Biology (3)**

Critical survey of the historical development of experimental designs for the solution of biological problems. 3 seminars. Prerequisite: Graduate standing and/or consent of instructor.

**BIO 524 Developmental Biology (3)**

Developmental phenomena of higher and lower plants, vertebrate and invertebrate animals at the molecular, cellular, histological and organ levels. Each quarter will emphasize a different biological description. 3 units per quarter. May be repeated to a maximum of 9 units. 2 seminars, 1 laboratory. Prerequisite: Graduate standing and/or consent of instructor.

**BIO 531 Theory and Prediction in Ecology (2)**

Directed group study and lectures on selected topics in ecology. Emphasis on an in-depth study of a restricted topic. 2 seminars. Prerequisite: Graduate standing and/or consent of instructor.

**BIO 542 Multivariate Biometry (4)**

Design of biological experiments involving multivariate observations. Experimental design, sampling, computer analysis, and interpretation of results. 3 seminars, 1 laboratory. Prerequisite: STAT 313, BIO 442.

**BIO 543 Morphometrics (3)**

Biological phenomena from problem definition and field collection of data through multivariate analysis of data and presentation of results. 2 seminars, 1 laboratory, 2-4 weekend field trips. Prerequisite: BIO 542.

**BIO 570 Selected Topics in Biology (1-3)**

Directed group study of selected topics for graduate students. Class schedule will list topics for selection. Topic credit limited to 9 units. 1 to 3 seminars. Prerequisite: Graduate standing and/or consent of instructor.

**BIO 590 Seminar in Biology (1)**

Problems and topics in advanced biology selected according to the interest and needs of the students enrolled. Maximum of 5 units. 1 seminar. Prerequisite: Graduate standing and/or consent of instructor.

**BIO 599 Thesis (3) (3) (3)**

Individual research under the general supervision of the staff, leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing and consent of instructor.

**BOT—BOTANY****BOT 121 General Botany (4)****GEB B.1.b.**

Introduction to structures and functions of seedbearing plants. 2 lectures, 2 laboratories.

**BOT 122 General Botany (4)****GEB B.1.b.**

Structure and relationships of plant groups from bacteria to angiosperms, emphasis on nonseedbearing plants of economic importance. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

**BOT 123 Introductory Plant Taxonomy (4)****GEB B.1.b.**

Introduction to classification and identification of vascular plants, emphasizing the families of major economic importance; field and herbarium techniques. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

**BOT 238 Native Plant Materials (3)**

Identification, habits of growth and growth requirements of native plants. Factors which affect plant usage in natural and manipulated environments. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: BOT 121.

**BOT 322 Introductory Plant Physiology (4)****GEB B.1.b.**

Consideration of the principal physiological processes of plants including water relations, mineral nutrition, photosynthesis, respiration, and growth of the plant. 3 lectures, 1 laboratory. Prerequisite: BOT 121 and CHEM 326.

**BOT 323 Plant Pathology (4)****GEB B.1.b.**

Comprehensive study of the causes and effects of disease in plants. Designed to lead to an understanding of the science and modern control methods. 2 lectures, 2 laboratories. Prerequisite: BOT 122 or BOT 123.

**BOT 324 Ornamental and Forest Pathology (4)****GEB B.1.b.**

Causes and effects of diseases of important ornamental and forest plants, disease agents (life cycle, host range, environmental relationships), and modern approach to control. 2 lectures, 2 laboratories. Prerequisite: BOT 121.

**BOT 325 Plant Nematology (4)**

Plant parasitic nematodes, their morphology, classification, and the damage they cause plants, alone or in combination with other pathogens. 2 lectures, 2 laboratories. Prerequisite: BOT 323, ENT 326.

**BOT 326 Plant Ecology (4)****GEB B.1.b.**

Effects on plant growth and development of the following environmental factors: soil, water, temperature, light, atmosphere, topography, organisms, and fire. 3 lectures, 1 laboratory. Prerequisite: BOT 123.

**BOT 333 Field Botany (4)****GEB B.1.b.**

Field identification of native and introduced plants in nature; factors affecting California plant distribution and relationships. Emphasis on local species. Several extended field trips. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: BOT 123.

**BOT 334 Morphology of Vascular Plants (4)****GEB B.1.b.**

Phylogenetic relationships of the plant kingdom as illustrated by comparative morphology of the vascular plants including living and fossil forms. 2 lectures, 2 laboratories. Prerequisite: BOT 123.

**BOT 335 Plant Anatomy (4)****GEB B.1.b.**

Microscopic study of vascular plants dealing with the origin, development and structure of cells, tissues and organs. 2 lectures, 2 laboratories. Prerequisite: BOT 122.

**BOT 337 Algology (4)****GEB B.1.b.**

Classification of marine and fresh-water algae. Consideration of ecological, physiological and economic aspects. 2 lectures, 2 laboratories. Prerequisite: BOT 122.

**BOT 343 Systematic Botany (3)****GEB B.1.b.**

Systems of plant classification and principles on which they are based; use of morphology, cytogenetics, and ecology in classification; rules of botanical nomenclature. 2 lectures, 1 laboratory. Prerequisite: BOT 123.

**BOT 350 Plant Tissue Culture Technology (4)**

Theoretical and technical aspects of plant tissue culture including callus, suspension, organogenesis and embryogenesis. 2 lectures, 2 laboratories. Prerequisite: BACT 221, BOT 322, BOT 335.

**BOT 425 Plant Virology (4)**

Plant pathogenic viruses, their plant, insect, nematode and fungal host-pathogen relationships, symptom recognition, isolation and identification methods. 2 lectures, 2 laboratories. Prerequisite: BOT 323.

**BOT 426 Mycology (4)**

Comparative morphology and nuclear behavior of the fungi. Summary of the science with special attention given to forms important in agriculture, medicine and industry. 2 lectures, 2 laboratories. Prerequisite: BOT 122, ZOO 132, or consent of instructor.

**BOT 431 Advanced Plant Pathology (4)**

Methods, instruments, and materials used in diagnosis of plant diseases and in plant disease research. 2 lectures, 2 laboratories. Prerequisite: BOT 323 or BOT 324.

**BOT 450 Plant Tissue Culture Applications (4)**

Introduction to the isolation of plant protoplasts, somatic hybridization techniques, techniques in vector transfer of DNA, biotransformation of secondary products. 2 lectures, 2 laboratories. Prerequisite: BIO 304, BOT 350.

## BUS—BUSINESS

### **BUS 101 The Business Enterprise (4)**

Orientation to the business administration program. Examination of the business enterprise, stressing its historical, environmental, and economic setting. Business organization and functions. 4 lectures.

### **BUS 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### **BUS 201 Business Law Survey (3)**

Overview of business law for other than business majors. Similar in scope to BUS 207, but in less detail. Not acceptable for credit toward Business Administration degree. 3 lectures.

### **BUS 205 Consumer Law (3)**

Concepts of legal and self-protection in the marketplace. Procedures to use administrative agencies and court system. Specific interest areas: landlord-tenant; sales and warranties; consumer protection groups; home, auto, insurance purchases, etc. 3 lectures.

### **BUS 207 Business Law (4)**

American legal system, contracts, agency, business organizations, and real property. 4 lectures. Prerequisite: Sophomore standing.

### **BUS 308 Advanced Business Law (4)**

Legal aspects of management decisions, including problems arising in sales, commercial paper, personal property and bailments, secured transactions, bankruptcy, and securities regulation, with emphasis on the uniform commercial code. 4 lectures. Prerequisite: BUS 207 or equivalent and junior standing.

### **BUS 400 Special Problems for Advanced Undergraduates (1-4)**

Individual investigation, research, studies, or surveys of selected problems. May be repeated for a maximum of 4 units of credit. Prerequisite: Senior standing or consent of instructor.

### **BUS 404 Governmental and Social Influences on Business (4)**

**GEB D.4.b.**

Analysis from legal, economic, political, and ethical perspectives, of the changing domestic and international environments of the business enterprise. Topics include administrative law and regulatory policy, antitrust law, public policy analysis, and the interaction of business and government. 4 lectures. Prerequisite: Senior standing.

### **BUS 430 Internship (4-8) (CR/NC)**

Placement as an employee in a business firm approved by the department head. Periodic written progress reports required. Collateral reading correlated with the work experience. Credit/No Credit grading. Prerequisite: Approval of department head.

### **BUS 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

### **BUS 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

### **BUS 500 Independent Study (1-4)**

Advanced study planned and completed under the direction of a member of the Business Administration department faculty. Open only to graduate students who have demonstrated ability to do independent work. Prerequisite: Formal petition with approval.

## CE—CIVIL ENGINEERING

### CE 111 Civil Engineering Fundamentals I (1) (CR/NC)

Description of the field of civil engineering and the function of the professional civil engineer. Introduction to the major subdivisions of civil engineering including environmental, geotechnical, structural, and water resource engineering. Credit/No Credit grading only. 1 lecture.

### CE 112 Civil Engineering Fundamentals II (2)

Continuation of CE 111. Application of basic design criteria to specific design problems, use of Civil Engineering department library computer programs for planning, analysis, and design. 2 activities. Prerequisite: MATH 141, PHYS 131.

### CE 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### CE 202, 203 Mechanics of Materials (3) (2)

Stresses, strains and deflections due to axial, torsional, and flexural loading. Statically indeterminate members and columns; Mohr's Circle and column buckling. Emphasis on problem solving. May not be substituted for CE 204 or CE 205. CE 202: 3 lectures; CE 203: 1 lecture, 1 laboratory. Prerequisite: ETME 205.

### CE 204, 205 Strength of Materials (3) (2)

Stresses, strains and their relations applied to axial, torsional and flexural loads. Statically indeterminate axial members, beams and shafts. Columns, dynamic loads, repeated loads. Tension, compression, bending, shear, and torsion tests. Use of the SR-4 strain rosette for determining principal strains. CE 204: 3 lectures; CE 205: 2 lectures. Prerequisite: ME 211.

### CE 206 Strength of Materials Laboratory (1)

Physical properties of engineering materials. Tension, compression, bending, shear, and torsion tests. Stress and strain transformation. Current strain gauge technology. 1 laboratory. Concurrent: CE 205.

### CE 221 Transportation Engineering I (4)

GEB F.2.

Review of highway, air, rail, mass transit and other modes. Evolution of U.S. transportation system. Transportation planning and operations. Feasibility analysis. Systems analysis, policy and management. 3 lectures, 1 laboratory. Prerequisite: MATH 141 or consent of instructor.

### CE 259 Civil Engineering Materials (2)

Experimental determination of mechanical properties of concrete, asphalt, and soils as required for engineering applications. Experimental verification of assumptions made in mechanics of materials procedures. Use of strain measuring devices. Preparation of technical reports. 2 laboratories. Prerequisite: CE 204.

### CE 336 Water Resources Engineering (4)

Application of rainfall intensity, frequency and duration statistics to design of hydraulic systems. Groundwater hydrology. Hydraulics of open channel flow and pressure conduits, flow through hydraulic structures, pumps and pump application. 4 lectures. Prerequisite: ME 341.

### CE 337 Hydraulics Laboratory (1)

Application of basic fluid dynamic principles to various mechanical systems. Exposure to experimental problems and techniques with guided laboratory projects related to civil engineering discipline. 1 laboratory. Prerequisite: ME 341.

### CE 352, 353 Structural Analysis I and II (3) (3)

General structural theorems, energy methods, influence diagrams, deflection of structures, analysis of statically determinate and indeterminate structures. Introduction to matrix methods of analysis and dynamic response. 3 lectures. Prerequisite: CE 204, CE 205.

### CE 355 Reinforced Concrete Design (3)

Analytical and design principles of reinforced concrete in designing civil engineering systems. Origin of code requirements. Fundamentals of proportioning. Details of elements and structural systems. 3 lectures. Prerequisite: CE 353.



**CE 381 Geotechnical Engineering I (4)**

General introduction to physical and engineering properties of soil, including origin, classification and identification methods, permeability, seepage, consolidation, soil strength, slope stability and soil compaction. Standard laboratory tests will be performed. 3 lectures, 1 laboratory. Prerequisite: CE 205, ME 341.

**CE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**CE 405 Advanced Strength of Materials (3)**

Equations of equilibrium and continuity in elastic solids. Generalized Hooke's Law. Two-dimensional solutions of beams, disks, rings under various loading conditions. Stress concentrations and their engineering significance. Strain-energy methods of solution. Fundamentals of plates and shells. 3 lectures. Prerequisite: CE 353, senior or graduate standing.

**CE 407 Structural Dynamics (4)**

Effect of vibration and transient loads on structural elements. Dynamics load factors, support motion, damping and natural frequencies of multidimensional structural systems. Modal analysis. 4 lectures. Prerequisite: CE 353, ME 212.

**CE 421 Transportation Engineering II (4)**

Elements of ground circulation and planning. Driver and vehicle performance. Traffic counting analysis and control. Planning of ground transportation units and terminals as elements of complete transportation systems. 3 lectures, 1 laboratory. Prerequisite: CE 221 or consent of instructor.

**CE 422 Geometric Design of Highways (4)**

Location and safe geometric design of highway and other transportation facilities. Earthwork and drainage related to highway, railway, dock, and airport design. Theory and practice in design of alignments, highway cross-sections, intersections, interchanges, and freeways in urban and rural areas. 3 lectures, 1 laboratory. Prerequisite: CE 221.

**CE 424 Public Transportation (4)**

Interdisciplinary aspects of public transportation problems, systems-team design approach to solutions. History and present state of public transportation; role of public transportation in urban environment; legislative, political, social, and economic aspects of public transportation systems. Methodology and procedures for transit planning. Review of transit studies. 3 lectures, 1 laboratory. Prerequisite: Senior standing or consent of instructor.

**CE 431 Coastal Hydraulics (3)**

Waves and their characteristics, types of waves, water wave theories, orbital velocities, refraction of waves, wave diffraction, wave reflection, application of linear theory to wave forces on cylindrical structures, submerged pipelines and vertical flat barriers (sea walls), wave uprush, rubble mound breakwaters. 3 lectures. Prerequisite: CE 336 or equivalent.

**CE 434 Groundwater Hydraulics and Hydrology (3)**

Differential equations of groundwater flow, Darcy Law, solutions of the steady and unsteady flow, differential equations for confined and unconfined flows. Pumping test design. Groundwater models, leaky aquifers. Saltwater intrusion. 3 lectures. Prerequisite: CE 336 or consent of instructor.

**CE 440 Water and Wastewater Engineering (4)**

Water and wastewater flows, design of water distribution systems, physical unit operations and chemical unit processes for water and wastewater treatment, biological unit processes for wastewater treatment, introduction to the design of water and wastewater treatment systems. 4 lectures. Prerequisite: CE 336, CE 337, ENVE 331.

**CE 453 Structural Steel Design (3)**

Design and behavior of the elements of steel structures. Proportioning of members and connections. Introduction to plastic design. 3 lectures. Prerequisite: CE 353.

**CE 454 Structural Design (4)**

Design of reinforced concrete, steel and timber structures. Load analysis, code design requirements and connection design. Comprehensive design projects. 2 lectures, 2 laboratories. Prerequisite: CE 353, CE 355, CE 453.

**CE 461, 462 Senior Project (2) (3)**

Selection and completion of a project which is typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

**CE 464 Professional Practice (3)**

Principles of professional engineering practice, the consulting engineer, engineering management, engineer-client relationships, professional ethics, marketing of engineering services, engineering agreements, case studies, analysis of uncertainty in engineering design. 3 seminars. Prerequisite: Senior standing.

**CE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**CE 481 Geotechnical Engineering II (4)**

Applications of soil mechanics principles and foundation engineering. Topics include: methods of subsurface exploration, lateral earth pressures, types and methods of design and construction of foundations of structures (including single and combined footings, mats, piles and caissons). Some advanced laboratory tests will be performed. 3 lectures, 1 laboratory. Prerequisite: CE 381.

**CE 487 Rock Mechanics (3)**

Methods for describing rock properties and application of rock mechanics for surface and underground excavations and foundations. Classification, stress and deformation, rock strength, underground openings, rock slope engineering and foundations. 3 lectures. Prerequisite: CE 481 or equivalent.

**CE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**CE 521 Airfield and Highway Pavement Designs (4)**

Theories, principles, and procedures in the structural design of highway and airfield pavements. Design of rigid and flexible pavements. Construction and maintenance procedures for pavements and stabilized bases. 3 lectures, 1 laboratory. Prerequisite: CE 259, graduate standing or consent of instructor.

**CE 523 Transportation Systems Planning (4)**

Planning of urban and statewide transportation systems. Air, water, rail, highway, and pipeline systems separately and in combination. Selection of routes and types of systems based on economic, social, technological, and other characteristics. Planning of terminals for all types of transportation systems. 3 lectures, 1 laboratory. Prerequisite: CE 221, ECON 211, graduate standing or consent of instructor.

**CE 525 Airport Planning and Design (4)**

Historical background of aviation and airport development; financing; estimating demand; aircraft characteristics; air traffic control; site selection; airport configuration; geometric design of landing area; planning and development of terminal areas; lighting; pavement design and drainage; design of heliports. 3 lectures, 1 laboratory. Prerequisite: CE 221 or equivalent, graduate standing or consent of instructor.

**CE 527 Traffic Engineering—Operations and Controls (4)**

Techniques for making traffic engineering investigations; traffic laws and ordinances, speed regulation, curb parking regulations, through controls, one-way streets, right-of-way regulations; design and application of signs, markings, lighting; and traffic engineering. 3 lectures, 1 laboratory. Prerequisite: CE 421 or equivalent, graduate standing or consent of instructor.

**CE 533 Advanced Water Resources Engineering (3)**

Matrix and simulation methods in hydrology, statistical studies in hydrology and their applications to civil engineering problems. Generalized hydrologic characteristics. Hydrologic simulation, computer applications, urban and small watershed hydrology, macroscopic and microscopic approach. Storm water management models. Hydrologic design. 3 lectures. Prerequisite: CE 336 or AE 315, graduate standing or consent of instructor.

**CE 554 Matrix Analysis of Structures (3)**

Matrix terminology and operations; matrix procedures for analysis of continuous beams, plane frames, and space frames under static and quasi-static loading; stiffness and flexibility methods; computer applications; special techniques for larger systems. 3 lectures. Prerequisite: CE 352, CE 353, graduate standing or consent of instructor.

**CE 558 Introduction to Finite Element Analysis (3)**

Formulation of the finite element method. Finite elements and their properties. Analysis of plates, shells and framed structures under static and dynamic loads. Digital computer implementation of the finite element method. 3 lectures. Prerequisite: CE 355, graduate standing or consent of instructor.

**CE 559 Advanced Structural Design (3)**

Advanced analysis, design and behavior of structural concrete. Reinforced, prestressed, and precast concrete elements. Linear and nonlinear structural systems. Origin of code requirements. Detailed design of components of civil engineering systems: beams, slabs, columns, continuous systems, walls, connections, and composite systems. 3 lectures. Prerequisite: CE 355, graduate standing or consent of instructor.

**CE 570 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CE 571 Selected Advanced Laboratory**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 3 laboratories. Prerequisite: Consent of instructor.

**CE 573 Public Works Administration (3)**

Management and engineering of transportation and related systems in public jurisdictions. Traffic systems, streets and highways, illumination, distribution systems, etc. Personnel management, financing, public relations, and contract management. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CE 574 Computer Applications in Civil Engineering (3)**

Overview of computer application, hardware and software alternatives, use of selected application programs, CAD, microcomputers, management and application of resources. 1 lecture, 2 laboratories. Prerequisite: Graduate standing or consent of instructor.

**CE 584 Advanced Soil Mechanics I (3)**

Engineering behavior of soil through the examination of its chemical, physical and mechanical properties, classification and identification of soils, surface chemistry of clays, stress and deformation, and steady state flow. 3 lectures. Prerequisite: CE 481 or equivalent, graduate standing or consent of instructor.

**CE 585 Advanced Soil Mechanics II (3)**

Engineering behavior of soil. Stress distribution, numerical analysis of flow and stress, limiting equilibrium analysis, soil dynamics. 3 lectures. Prerequisite: CE 584 and graduate standing.

**CE 586 Advanced Foundation Engineering (4)**

Illustrative design examples drawn from soil and rock engineering problems encountered in civil engineering, including earth retaining structures, shallow foundations and deep foundations. 4 lectures. Prerequisite: CE 481, graduate standing or consent of instructor.

**CE 591 Graduate Seminar (2)**

Current trends and characteristics of civil engineering. Group discussions of skills, techniques and practices. Reports and discussions by students, based on topics of interest to persons preparing for a career in civil engineering. 1 seminar, 1 laboratory. Prerequisite: Graduate standing in Civil/Environmental Engineering or consent of instructor.

**CE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

**CHEM—CHEMISTRY****CHEM 106 Introductory Chemistry (3)**

Measurement, metric system, properties of matter, chemical symbols, atomic structure, chemical formulas, nomenclature, chemical equations, the mole concept, stoichiometry. An introductory course in chemistry, not open to students who have credit for a college chemistry course. 3 lectures. Prerequisite: MATH 103 or equivalent.

**CHEM 121 General Chemistry (4)**

Fundamental principles including atomic structure, bonding, nomenclature, chemical equations, states of matter, solutions, and energy with attention to applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering and Technology or Science and Mathematics. Not open to students with credit for CHEM 124 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

**GEB B.1.a.****CHEM 122 General Chemistry (4)**

Continuation of CHEM 121. Colloids, kinetics, equilibrium, acids and bases, electrochemistry, nuclear chemistry, nonmetals, applications to related fields. Intended primarily for students whose majors are not in the Schools of Engineering and Technology or Science and Mathematics. Not open to students with credit for CHEM 125 or CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 121.

**GEB B.1.a.****CHEM 124 General Chemistry (4)**

Atomic structure, chemical equations, stoichiometry (mass balance in chemical reactions), naming of simple inorganic compounds, solutions. Introduction to carbon compounds emphasizing fuels and polymers. Intended primarily for engineering majors, except Engineering Technology and Industrial Technology. Not open to students with credit for CHEM 121 or CHEM 127. 3 lectures, 1 laboratory. Prerequisite: CHEM 106 or equivalent or consent of instructor.

**GEB B.1.a.****CHEM 125 General Chemistry (4)**

Introduction to chemical thermodynamics (energy balance in chemical reactions), equilibrium, rates of reaction, acids and bases, coordination compounds, oxidation-reduction reactions, electrochemistry, corrosion, nuclear chemistry. Intended primarily for students whose majors are in the School of Engineering and Technology. Not open to students with credit for CHEM 122 or CHEM 128. 3 lectures, 1 laboratory. Prerequisite: CHEM 124.

**GEB B.1.a.**

**CHEM 127 General Chemistry (4)****GEB B.1.a.**

Introduction to atomic structures, bonding, stoichiometry, nomenclature, gas laws, states of matter and solutions. Intended primarily for students whose majors are in the School of Science and Mathematics. Not open to students with credit in CHEM 121 or CHEM 124. 3 lectures, 1 laboratory. Prerequisite: High school algebra and chemistry or CHEM 106.

**CHEM 128 General Chemistry (4)****GEB B.1.a.**

Continuation of CHEM 127. Discussion of colligative properties, colloids, kinetics, equilibria, acid-base equilibria, nuclear chemistry, thermochemistry and electrochemistry. Intended primarily for students whose majors are in the School of Science and Mathematics. Not open to students with credit in CHEM 122 or CHEM 125. 3 lectures, 1 laboratory. Prerequisite: CHEM 127.

**CHEM 129 General Chemistry (4)****GEB B.1.a.**

Chemical equilibria, compounds of the metals, laboratory study of the chemical properties and semi-micro qualitative analysis of the representative group elements of the periodic table. Intended primarily for students whose majors are in the School of Science and Mathematics. 3 lectures, 1 laboratory. Prerequisite: CHEM 125 or CHEM 128, or consent of instructor.

**CHEM 156 General Chemistry Laboratory (1)****GEB B.1.a.**

Additional laboratory to be taken with CHEM 129. Includes chemical properties and semi-micro qualitative analysis of the transition and post-transition metal ions of the periodic table, methods of inorganic synthesis. 1 laboratory. Prerequisite: CHEM 122, CHEM 125, or CHEM 128.

**CHEM 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**CHEM 252 Laboratory Glassblowing (1)**

Techniques of glassblowing applied to the making of simple laboratory apparatus. 1 laboratory. Prerequisite: CHEM 121, CHEM 124 or CHEM 127.

**CHEM 253 Chemical Literature (1)**

Chemical periodicals, patents, abstracts; Beilstein, Gmelin; reference books and encyclopedias; literature searches, computerized information retrieval. 1 lecture. Prerequisite: CHEM 326 or CHEM 316.

**CHEM 301 Biophysical Chemistry (3)**

Basic physical chemistry for the study of biological systems. Kinetic-molecular theory, gas laws, principles of thermodynamics as applied to biochemical systems. Not open to students with credit in CHEM 305. 3 lectures. Prerequisite: CHEM 328 or concurrent CHEM 371, PHYS 123 or PHYS 133, MATH 132 or MATH 142.

**CHEM 302 Biophysical Chemistry (4)**

Application of physical chemistry to biochemical systems. Buffers, electrochemistry, reaction rate theory, enzyme kinetics, viscosity, surface and transport properties of macromolecules. Not open to students with credit in CHEM 306. 3 lectures, 1 laboratory. Prerequisite: CHEM 301 or CHEM 305; CHEM 328 or CHEM 371.

**CHEM 305 Physical Chemistry (3)****GEB B.1.a.**

Introduction to chemical thermodynamics. Thermochemistry. Phase equilibria. Chemical equilibrium. 3 lectures. Prerequisite: PHYS 123 or PHYS 133, CHEM 125 or CHEM 129, MATH 132 or MATH 142.

**CHEM 306 Physical Chemistry (3)**

Applications of chemical thermodynamics. Electrochemistry. Kinetic theory of gases. Chemical kinetics. 3 lectures. Prerequisite: CHEM 305.

**CHEM 307 Physical Chemistry (4)**

Introduction to quantum theory. Chemical bonding and molecular structure. Spectroscopy and diffraction. 3 lectures, 1 laboratory. Prerequisite: CHEM 302 or CHEM 306 and CHEM 356, or consent of instructor.

**CHEM 316 Organic Chemistry (4)****GEB B.1.a.**

Structure, bonding, nomenclature, isomerism, stereochemistry and physical properties of organic compounds. Reactions and mechanisms of alkanes, alkenes, alkynes, cycloalkanes. Laboratory techniques in organic preparations. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 128.

**CHEM 317 Organic Chemistry (5)**

Reactions and reaction mechanisms of organic halides, alcohols, phenols, epoxides, ethers, carboxylic acids and their derivatives, aldehydes, ketones; acidity and basicity; infrared and NMR spectroscopy. 3 lectures, 2 laboratories. Prerequisite: CHEM 316.

**CHEM 318 Organic Chemistry (5)**

Chemistry of amines, aromatic compounds, heterocycles, macromolecules, some biomolecules, carbanions, rearrangements; mass spectrometry. Practice in organic synthesis. 3 lectures, 2 laboratories. Prerequisite: CHEM 317.

**CHEM 326 Survey of Organic Chemistry (4)****GEB B.1.a.**

Structure, nomenclature, some characteristic reactions of functional groups and applications of organic chemicals in agriculture, medicine, industry and the home. A terminal survey course not open to students with credit in CHEM 316. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CHEM 125 or CHEM 128.

**CHEM 328 Biochemistry (4)****GEB B.1.a.**

Fundamental chemistry of carbohydrates, proteins, fats, vitamins, enzymes and hormones as applied to their function in plant and animal metabolism. Special reference to the application of chemistry to the areas of agriculture, human health and nutrition, and the production of food and animal feeds. 3 lectures, 1 laboratory. Prerequisite: CHEM 326.

**CHEM 331 Quantitative Analysis (5)****GEB B.1.a.**

Introduction to the principles of analytical chemistry. Sampling, interpretation of data, and the application of chemical equilibria to analytical problems. Survey of important analytical methods emphasizing the theory and implementation of titrimetric methods. 3 lectures, 2 laboratories. Prerequisite: CHEM 129.

**CHEM 332 Quantitative Analysis (4)**

Theory and analytical techniques associated with gravimetric analysis and titrimetric precipitrimetry. Continuation of redoximetry. Introduction to instrumental methods of analysis, with theory and application of electrogravimetry, potentiometry and spectrophotometry. 2 lectures, 2 laboratories. Prerequisite: CHEM 331.

**CHEM 335 Clinical Chemistry (3)**

Basic principles of physiological chemistry including clinical significance of medical laboratory data. Introduction to medical laboratory techniques used in the quantitative determination of glucose, protein, hemoglobin and electrolytes in biological fluids including blood, serum, and urine. 2 lectures, 1 laboratory. Prerequisite: CHEM 328 or CHEM 371, and CHEM 331.

**CHEM 336 Clinical Chemistry (4)**

Advanced principles of physiological chemistry including clinical significance of medical laboratory data. Theoretical and practical aspects of diagnostic enzymology and biochemical profiling. Medical laboratory techniques used in the determination of renal and liver function, lipids, enzymes, hormones, and toxic substances. 3 lectures, 1 laboratory. Prerequisite: CHEM 335.

**CHEM 341 Environmental Chemistry I (3)****GEB B.1.a.**

Nature, composition, reactions, redox equilibria and complexation in natural water systems. Microorganisms as aquatic catalysts, heterogeneous reactions, chemical aspects of water treatment and pollution. 3 lectures. Prerequisite: CHEM 129.

**CHEM 342 Environmental Chemistry II (3)****GEB B.1.a.**

Nature and composition of the atmosphere. Oxides of carbon, sulfur and nitrogen. Organic and inorganic pollutants, particulate matter, photochemical smog. Environmental chemistry of soil and mineral resources. 3 lectures. Prerequisite: CHEM 129 and CHEM 326 or CHEM 316.

**CHEM 344 Chemical Process Principles (3)**

Fundamental terms, concepts, and principles used in the chemical processing industries. 3 lectures. Prerequisite: CHEM 316 or consent of instructor.

**CHEM 350 Chemical Safety (1)****GEB B.1.a.**

Laboratory regulations, equipment hazard analysis, hazardous chemicals, classification of chemicals, toxic materials handling, reaction hazards, radiation, emergency procedures, safety management programs and legal concerns. Includes project. 1 lecture. Prerequisite: CHEM 326 or equivalent.

**CHEM 355 Physical Chemistry Laboratory (1)**

Experimental studies of gases, solutions, thermochemistry and chemical equilibria. 1 laboratory. Corequisite: CHEM 305.

**CHEM 356 Physical Chemistry Laboratory (1)**

Experimental studies of phase rule, electrochemistry and chemical kinetics. 1 laboratory. Corequisite: CHEM 306.

**CHEM 371 General Biochemistry I (4)****GEB B.1.a.**

Chemical and physical factors in biological processes. Chemistry and function of major cellular constituents: proteins, nucleic acids, lipids, carbohydrates, vitamins. 3 lectures, 1 laboratory. Prerequisite: CHEM 326 or 317. Strongly recommended: CHEM 331.

**CHEM 372 General Biochemistry II (3)**

Intermediary metabolism, regulation and integration of metabolic pathways, bioenergetics, photosynthesis, electron transport, nitrogen fixation, biochemical function of vitamins and minerals. 3 lectures. Prerequisite: CHEM 371.

**CHEM 373 General Biochemistry III (3)**

Synthesis, conformation and structure of biopolymers: nucleic acids and proteins. Function of macromolecular complexes: cell walls, ribosomes, membranes, and others. Biochemical genetics, cell differentiation and regulation, viruses and biochemical evolution. 3 lectures. Prerequisite: CHEM 371.

**CHEM 374 Biochemistry Laboratory (2)**

Experiments in metabolism, including animal and microbial studies; isolation and characterization of enzymes and nucleic acids. 2 laboratories, offered during the same day or on consecutive days to simulate biochemical research conditions. Prerequisite: CHEM 371.

**CHEM 377 Chemistry of Drugs and Poisons (3)**

Introduction to pharmacology: history, sources, development and testing, physical and chemical properties, biochemical and physiological effects, mechanisms of action, and the therapeutic uses and toxicology of common drugs and poisons acting on the nervous, cardiovascular, immune and hormone systems, and on cancer, infectious disease, etc. Especially applicable to students in nonbiochemical disciplines. 3 lectures. Prerequisite: CHEM 328 or CHEM 371 or consent of instructor.

**CHEM 378 Biochemical Pharmacology (3)**

Consideration of current selected topics in pharmacology including drug design, biochemical mechanisms of drug activity and issues pertaining to the disposition of drugs to the public. Lecture, professional consultation, library research, and student presentations. 3 lectures. Prerequisite: CHEM 377 or equivalent as determined by instructor.

**CHEM 385 Geochemistry (3)**

Application of chemical principles to terrestrial and extraterrestrial systems. Formation of the elements; chemical influences on the earth's formation; chemical evolution studies; age-dating techniques; reactions in sea water; petroleum and ore formation; distribution and movement of the elements. 3 lectures. Prerequisite: CHEM 316, CHEM 331.

**CHEM 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**CHEM 405 Advanced Physical Chemistry (3)**

Fundamentals of quantum chemistry and their application. Selected advanced topics in physical chemistry. 3 lectures. Prerequisite: CHEM 307.

**CHEM 419 Advanced Organic Chemistry (3)**

Detailed study of the mechanisms of organic reactions and related topics. 3 lectures. Prerequisite: CHEM 305, CHEM 318.

**CHEM 435 Food Analysis (4)**

Techniques used commercially in the chemical analysis of seed and cereal crops, fruit and vegetable crops, forage crops, meat and meat products, milk and dairy products, eggs and poultry products. Vitamin determinations, microbiological assay, quality control, taste testing, legal specifications, grading and labeling. 3 lectures, 1 laboratory. Prerequisite: Course in biochemistry.

**CHEM 436 Agricultural Chemicals (4)**

Chemistry of fungicides, insecticides, rodenticides, plant growth regulators, soil conditioners, and fertilizers. Special reference to the analysis, manufacture, toxicology, legal specification, and regulations. 3 lectures, 1 laboratory. Prerequisite: Course in biochemistry.

**CHEM 439 Instrumental Analysis (5)**

Theory, practice and method selection of modern instrumental analytical techniques, including spectroscopic, electrochemical, chromatographic and thermal methods. Current industrial applications. Laboratory work emphasizes optimization of experimental parameters. 3 lectures, 2 laboratories. Prerequisite: CHEM 331, CHEM 356 or CHEM 302. Recommended: CHEM 307.

**CHEM 444 Polymer Chemistry (3)**

Polymerization methods and reaction mechanisms; physical properties of polymers and their measurement; chemistry of initiators, catalysts and inhibitors; stereospecific polymers; uses of representative types. 3 lectures. Prerequisite: CHEM 317.

**CHEM 457 Qualitative Organic Analysis (3)**

Experimental determination of the identity of organic compounds. Emphasis on chemical methods. 1 lecture, 2 laboratories. Prerequisite: CHEM 317.

**CHEM 458 Instrumental Organic Qualitative Analysis (2)**

Separation, purification, and identification of organic molecules using chemical and instrumental methods, including nuclear magnetic resonance, infrared and ultraviolet spectroscopy and mass spectroscopy. 2 laboratories. Prerequisite: CHEM 457.

**CHEM 459 Undergraduate Seminar (2)**

Oral presentation of current developments in chemistry based on current literature. Preparation for employment and for independent work in chemistry. 2 seminars. Prerequisite or corequisite: CHEM 253 and senior standing.

**CHEM 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: CHEM 459.

**CHEM 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: CHEM 301, or CHEM 305, or CHEM 317 or consent of instructor.

**CHEM 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**CHEM 481 Inorganic Chemistry (3)**

Systematic study of important elements based on periodic grouping and atomic structure with emphasis on chemical bonding, coordination compounds, and acid-base relationships. 3 lectures. Prerequisite: CHEM 306 or consent of instructor.



**CHEM 482 Synthetic Inorganic Chemistry (3)**

Inorganic systems. Discussion of the historical development of inorganic compounds and their uses. Emphasis on symmetry, isomerism, structure, and methods of synthesis. Laboratory involves preparation of inorganic compounds using high temperature, inert atmosphere, photolysis, electrolytic and other synthetic techniques. 2 lectures, 1 laboratory. Prerequisite: CHEM 481 or consent of instructor.

**CHEM 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated the ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department graduate coordinator.

**CHEM 501 Physical Chemistry—Thermodynamics (3)**

Deductive systematization of classical thermodynamics and its chemical applications. Introduction to statistical thermodynamics and its application to the calculation of thermodynamic properties. 3 seminars. Prerequisite: CHEM 307, CHEM 316 or consent of instructor.

**CHEM 502 Physical Chemistry—Quantum Chemistry (3)**

Theory and methods of quantum chemistry with application to the investigation of molecular structure, chemical bonding, and molecular spectra. 3 seminars. Prerequisite: CHEM 405 or consent of instructor.

**CHEM 503 Kinetics and Catalysis (4)**

Reaction rates and mechanisms of homogeneous and heterogeneous, noncatalyzed and catalyzed reactions. Interdisciplinary laboratory skills development related to industrial catalysis research. 2 lectures, 2 laboratories. Prerequisite: CHEM 307, CHEM 318 or consent of instructor.

**CHEM 514 Advanced Organic Chemistry—Synthesis (3)**

Modern methods of organic synthesis. Carbon-carbon bond forming reactions, functional group transformations, protecting groups, strategies of total synthesis of natural products. 3 seminars. Prerequisite: CHEM 318.

**CHEM 515 Advanced Organic Chemistry—Mechanisms (3)**

Mechanisms of pericyclic reactions; selection rules. Introduction to photochemistry; free radical reactions. 3 seminars. Prerequisite: CHEM 318.

**CHEM 516 Advanced Organic Chemistry—Natural Products (3)**

Structure determination and total synthesis of compounds of biological origin. 3 seminars. Prerequisite: CHEM 318.

**CHEM 528 Nutritional Biochemistry (3)**

Nutritional aspects of biochemistry. Lecture, library research and student presentations. Topics include vitamins and minerals, essential and energy providing nutrients, deficiency, degenerative and genetic diseases of metabolism. Emphasis on current research and controversy. 3 lectures. Prerequisite: Course in biochemistry.

**CHEM 541 Synthetic Methods (2-4)**

Techniques for synthesis of organic and inorganic substances. Use of modern equipment and methods; inert atmosphere, low and high temperature, low and high pressure, semi-micro technique, separation and purification techniques. 2 to 4 laboratories. Prerequisite: CHEM 458.

**CHEM 572 Advanced Biochemistry (3)**

Protein structure and function. Lecture, library research and student presentations. Topics encompass considerations of the physical structure of proteins, domain theory, protein folding, and current methods of structural analysis as well as methods for determining enzyme mechanisms including kinetics, isotope effects, stereochemistry, cryoenzymology, trapping of intermediates, and transition state analogues. 3 lectures. Prerequisite: CHEM 371 and CHEM 302 or CHEM 306 or equivalents as determined by instructor.

**CHEM 573 Advanced Biochemistry (3)**

Advanced study of nucleic acid structure and function. Format includes lecture, library research and student presentations. Topics include immunochemistry or mechanisms of genetic regulation and cell differentiation, advances in knowledge of nucleic acid sequence and organization, chromosome structure, and molecular aspects of genetic diseases, including cancer. 3 lectures. Prerequisite: CHEM 373 or equivalent.

**CHEM 574 Advanced Biochemistry (3)**

Advanced study of membranes and metabolism. Lecture, library research and student presentations. Membrane structure and function, hormone interactions, mitochondria structure and function, immunochemistry and neurochemistry. 3 lectures. Prerequisite: CHEM 373 or equivalent as determined by instructor.

**CHEM 590 Graduate Seminar (1)**

Advanced topics in chemistry, including original work by faculty, guests, and graduate students. Topics vary each quarter. Total credit limited to 3 units. Required of all graduate students in chemistry. 1 seminar. Prerequisite: Graduate standing in chemistry, or consent of instructor.

**CHEM 598 Internship (3-6)**

Supervised technical field experience in areas such as chemical sales, manufacturing, process development, clinical chemistry, analytical chemistry, pollution control. Prerequisite: Graduate standing or consent of instructor, and approval of the department head and school dean.

**CHEM 599 Thesis (3) (3) (3)**

Individual research under the general supervision of the staff leading to a graduate thesis of suitable quality. Prerequisite: Graduate standing in chemistry.

**CM—CONSTRUCTION MANAGEMENT****CM 201 Introduction to Construction Management (3)**

Overview of the construction industry and its markets, impact, practices, methods, and ethics. 3 lectures. Prerequisite: Second-year standing.

**CM 321 Concrete Technology (3)**

Modern concepts which form the basis for solutions to problems of concrete construction. Includes significant developments in concrete chemistry and strength theory from 1963 to present. Development of a rational basis for writing concrete specifications and for proportioning concrete mixes. 2 lectures, 1 laboratory. Prerequisite: ARCE 223, ARCE 301.

**CM 325 Construction Management Practices (3)**

Overview of construction methods, building systems, construction and contract documents, cost estimating and scheduling and other practices used in the contracting process. For nonmajors. 2 lectures, 1 activity.

**CM 331 Construction Cost Control (3)**

Basic application of construction cost control systems and the use of cost information and associated reports. 3 lectures. Prerequisite: Third-year standing and one approved accounting course.

**CM 332 Cost Alternatives Evaluation (4)**

Basic principles of economic evaluations between cost alternatives. 4 lectures. Prerequisite: Third-year standing in Construction Management.

**CM 333 Construction Contracts Administration (3)**

Administration of construction documents including invitation to bid, addenda, proposals, change orders, subcontracts, liens, claims, waivers, and arbitration. 3 lectures. Prerequisite: Third-year standing, BUS 201.

**CM 341 Wood and Masonry Construction Practices (3)**

Building systems, equipment, materials, and techniques. One designated field trip required. 3 laboratories. Prerequisite: ARCH 232, ARCE 223.

**CM 342 Concrete and Formwork Construction Practices (3)**

Building systems, equipment, materials, and techniques. One designated field trip required. 3 laboratories. Prerequisite: ARCH 232, ARCE 223.

**CM 343 Steel and Earthwork Construction Practices (3)**

Building systems, equipment, materials, and techniques. One designated field trip required. 3 laboratories. Prerequisite: ARCH 232, ARCE 223.

**CM 350 Computer Applications in Construction Management (2)**

Application of computer systems to control construction operations in the building industry. Development of construction management games. 2 lectures. Prerequisite: CSC 110 or EDES 250, STAT 211.

**CM 351, 352, 353 Building Support System Construction Practices (3) (3) (3)**

Building support systems, equipment, materials and techniques of installation and construction. Emphasis on the role of specialty subcontractors in the construction process. 3 activities. Prerequisite: ARCH 232, PHYS 137.

**CM 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**CM 412 Construction Regulations (2)**

Laws and legal problems related to the construction industry. Contractor's licensing law, labor laws, lien laws, and safety requirements. 2 lectures. Prerequisite: Fourth-year standing.

**CM 415 Concrete Testing Laboratory (1)**

Concrete mix design, physical properties of concrete, use of admixtures, concrete batching, concrete curing, testing of concrete and concrete specifications. Includes mix design, batching and physical testing of the designed mixes. 1 laboratory. Prerequisite: ARCE 301.

**CM 420 Construction Cost Estimating (2)**

Survey of methods and practices of construction cost estimating. Solutions to problems in estimating. For students not majoring in Construction Management. 1 lecture, 1 laboratory. Prerequisite: Fourth-year standing.

**CM 433 Economic Analysis for Engineers (2)**

Engineering economics, and engineering studies including feasibility and alternate problem analysis. 2 lectures.

**CM 441 Heavy and Civil Works Construction (3)**

Heavy and civil works construction methods, stressing field operations management. 3 activities. Prerequisite: Third-year standing.

**CM 442 Building Estimating (2)**

Procedures for estimating costs of buildings. 2 activities. Prerequisite: CM 341, CM 342, CM 343.

**CM 443 Principles of Construction Management (3)**

Applications of a broad range of construction management techniques to case studies involving a variety of operations in construction firms. 3 activities. Prerequisite: Fourth-year standing.

**CM 451 Industrial and Process Construction (4)**

Methods and procedures used on industrial and process construction projects. 4 laboratories. Prerequisite: CM 341, CM 342, CM 343.

**CM 452 Project Controls (4)**

Planning, organization, scheduling, and control of construction projects. 4 laboratories. Prerequisite: CM 341, CM 342, CM 343.

**CM 453 Project Development (4)**

Methods and procedures used in the development of a residential, commercial, or industrial project. 4 laboratories. Prerequisite: CM 341, CM 342, CM 343.

**CM 461, 462 Senior Project (2) (1) (CR/NC)**

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. Construction and team projects encouraged. To be completed in two consecutive quarters. 90 hours minimum total time. Credit/No Credit grading only. Prerequisite: CM 341, CM 342, CM 343.

**CM 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CM 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**CM 531 Construction Cost and Material Control (3)**

Advanced theory and practice of cost and material control for construction projects. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 331 or consent of instructor.

**CM 533 Case Histories in Contract Administration (3)**

Common points of disputes between design professional, owner, and contractor. Methods of avoidance and dispute resolution. 3 activities. Prerequisite: CM 333, 4th year architectural practice or consent of instructor.

**CM 542 Construction Estimating and Bidding Strategy (3)**

Advanced theory and practice of cost estimating techniques. Includes standard, conceptual and parameter estimating; risk analysis. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 420 or consent of instructor.

**CM 552 Construction Project Scheduling (3)**

Basic and advanced network scheduling techniques as applied to architectural building projects. Emphasis on computer applications. 2 lectures, 1 activity. Prerequisite: CM 542 or consent of instructor.

## CONS—CONSERVATION

**CONS 120 Fisheries and Wildlife Management (3)**

Survey of fisheries and wildlife resources and management practices. Relationships to recreational values, land management, food production, and preservation. 3 lectures.

**CONS 201 Lake Management (4)**

Practices and management of recreational lakes to provide maximum use, to reduce aquatic pests, to provide necessary water quality, and to attract or produce aquatic animals associated with hunting and fishing preserves, farm ponds, and ornamental and recreational waters. 3 lectures, 1 laboratory. Prerequisite: Consent of instructor.

**CONS 207 Resource Survey (3)**

Dynamic exercise and field experience pertaining to natural resources measurements. Inventory methods of vegetation and wildlife sampling and questionnaire surveys. 2 lectures, 1 laboratory.

**CONS 221 Wildlife Techniques (3)**

Techniques for working with terrestrial wildlife. Field and lab procedures for habitat analysis, telemetry, marking, capture, determination of age and sex, and population analysis. 2 lectures, 1 laboratory. Prerequisite: CONS 120.

**CONS 311 Introductory Conservation (3)**

Basic principles and problems of conservation. Organization, control and interrelationships of government and private agencies dealing with the conservation of natural resources. 3 lectures. Prerequisite: One course in Biological Sciences.

**CONS 320 Fishery Resource Management (4)**

Management of recreational and commercial fisheries to produce sustained annual crops of fishes. Survey, inventory, and evaluation techniques used for the management of a fishery. Methods of manipulating fish populations and the aquatic habitat. 3 lectures, 1 laboratory. Prerequisite: BIO 325.

**CONS 325 Wildlife Habitat Management (4)**

Habitat design, development, and management on lands that support wildlife. Habitat development planning project required. 3 lectures, 1 laboratory. Some weekend labs necessary. Prerequisite: BIO 325.

**CONS 420 Culture of Fishes (4)**

Management of a production fish hatchery. Facility design, water supply, quality, and control; production regimen; and process methods for game, food, and bait fishes. 3 lectures, 1 laboratory. Prerequisite: CONS 320.

**CONS 422 Freshwater Fisheries (3)**

Freshwater fish and fishery resources of the Pacific Coast. Identification, life history, ecology and economics of important western and local species. Field trips to various warm and cold water fishery facilities. 2 lectures, 1 laboratory. Prerequisite: ZOO 132. Recommended: ZOO 322.

**CONS 426 Resource Population Dynamics (3)**

Growth, fluctuations, balance, and natural mechanisms for control of wild animal populations. 3 lectures. Prerequisite: BIO 325 or one course in ecology.

**CONS 427 Marsh Management (4)**

Land, plant, animal, and water management on wetlands to provide suitable habitat for wildlife. Emphasis on waterfowl: identification, behavior, nesting requirements, foods, and diseases. 3 lectures, 1 laboratory. Prerequisite: BOT 123, BIO 325, or one course in ecology.

**CONS 431 Game Management (4)**

General principles, problems and techniques of increasing the harvest of waterfowl, upland game, and big game. Identification and life histories of important western game species. Several weekend field trips. 3 lectures, 1 laboratory. Prerequisite: BIO 325 or ASCI 229.

**CONS 433 Aquaculture (4)**

Biological, physical, chemical, and economic aspects of reproduction, development, growth, nutrition, and disease of fish in culture. Modern methods and problems in the culture of warm water species, especially those suited to farm situations. 3 lectures, 1 laboratory. Prerequisite: ZOO 132 and BIO 334. Recommended: ZOO 322.

## CRP—CITY AND REGIONAL PLANNING

**CRP 101 Introduction to the Profession of City and Regional Planning (1) (CR/NC)**

Orientation to the jobs and responsibilities of professional planners working in the public and private sectors. Credit/No Credit grading only. 1 lecture.

**CRP 203 Applied Design and Planning Fundamentals (3) (Also listed as LA 203)**

Applications of basic design fundamentals and the design of environments through design exercises. 3 laboratories. Prerequisite: EDES 201, EDES 202, LA 213.

**CRP 211 Introduction to Urbanization (3)****GEB F.2.**

Evolution, planning, and design of cities. Interpretation of environmental, social, economic, and technological factors that have influenced the physical organization, planning, and design of cities. 3 lectures.

**CRP 212 Introduction to Urban Planning (3)****GEB F.2.**

Problems and responses to contemporary urban growth and change. Development of theories of urban planning and design. Introduction to zoning, planning regulations and codes, professional practice. Relationship of environmental design disciplines, citizen groups, and individuals to planning. 3 lectures.

**CRP 213 Survey Methods (3)**

Sources of information and data related to city and regional planning, architecture, and environmental design. Search, selection, reduction of data, and application to program development. 3 lectures. Prerequisite: CRP 212.

**CRP 214 Urban and Regional Processes (3)**

How cities and regions work, grow or decline; their relationship to public and private actions. Spatial analysis and locational theories. Integrated perspective for environmental design professions. 3 lectures. Prerequisite: CRP 212.

**CRP 216 Computer Applications for Planning (2)**

Introduction to the use of computer facilities and software programs with special applications for planners. 2 laboratories. Prerequisite: CSC 110 or equivalent.

**CRP 218 Exploring Future Environments (3)**

Examination and implications of emerging and potential social, technical, and resource changes for human living environments. Futures scenario explorations of characteristics for environmentally and socially sustainable rural and urban communities. Guest lecturers and discussions. 3 lectures.

**CRP 240 Additional Planning Laboratory (1-2)**

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

**CRP 243 Site Planning (3)**

Art and science of arranging structures, circulation systems, utilities and plant material on natural and urban sites to support human behavior in three-dimensional spaces while minimizing disruption to natural systems. Emphasis on special types including planned unit developments, waterfronts, hillsides, campuses and commercial centers. 3 laboratories. Prerequisite: LA 213.

**CRP 314 Planning Theory (3)**

Theory of planning and the role of theory in planning. Role of planner in society, purpose of planning, administrative framework in which planning takes place, and the rational model. 3 lectures. Prerequisite: CRP 214.

**CRP 347, 348 Urban and Regional Design (3) (3)**

Three-dimensional design of urban and regional areas within the comprehensive planning process. Effect of human activities on the form of the natural and built environment at differing scales. 3 laboratories. Prerequisite: CRP 203, CRP 216, LA 213.

**CRP 351, 352, 353 Planning Laboratory (4) (4) (4)**

Case study application of planning theory to the community, its components, and to the city and the region. Relationships of city spaces and structures. Redevelopment. Field trips. Individual team, and interdisciplinary approaches. Computer applications. 4 laboratories. Prerequisite: CRP 213, CRP 214, CRP 216, LA 213, GEOG 250, NRM 304, STAT 251.

**CRP 360 Urban Aesthetics (1-3)**

Aesthetics as an important aspect of the physical and social organization of cities. Identification, study, and evaluation of aesthetic design in the context of the present. 1-3 lectures. Prerequisite: Junior standing and consent of instructor.

**CRP 400 Special Problems for Advanced Undergraduates (1-2)**

Individual or group investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**CRP 407 Environmental Law (3) (Also listed as NRM 407)**

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, and consent of instructor.

**CRP 408 Water Resource Law and Policy (3) (Also listed as NRM 408)**

Detailed examinations of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: NRM 302 or instructor approval, senior standing.

**CRP 409 Planning Internship (2) (CR/NC)**

Work experience as a supervised employee in a government or related agency. Prior contract specifying the product of internship required between student, agency and faculty. Thirty hours work experience per unit of credit. Credit/No Credit grading. Prerequisite: Fourth year standing in CRP and permission of instructor.

**CRP 418 New Town Planning (3)**

History, present situation and future of new town planning in the United States. Relationship to other countries. 3 lectures. Prerequisite: CRP 212.

**CRP 420 Planning Law (3)**

Public controls protecting natural environmental systems. Land use and resource controls. Review of control mechanisms. State and federal legislation. Legal implications of controls, public planning and policy issues. 3 lectures. Prerequisite: CRP 353.

**CRP 430 Planning Administration (3)**

Relationships of planning agencies to other governmental bodies, public agencies and citizen groups. The public planning agency and the private practitioner. Public and personnel relations. Current topics in planning administration. 3 lectures. Prerequisite: Graduate, second year standing; undergraduate, CRP 451.

**CRP 435 Transportation Theory (3)**

Circulation and transportation elements of the General Plan. Transportation planning theory, methods and tools related to systematic analysis of city and regional transportation problems including environmental impact assessment. 3 lectures.

**CRP 447 Urban and Regional Design (4)**

Three-dimensional design of urban and regional areas within the comprehensive planning process. Effect of human activities on the form of the natural and built environment at differing scales. 4 laboratories. Prerequisite: CRP 348, CRP 451.

**CRP 451, 452, 453 Planning Laboratory (4) (4) (4)**

Continuation of CRP 351, 352, 353. 4 laboratories. Prerequisite: CRP 353.

**CRP 457 Planning Information Systems (3)**

Use of a problem-oriented system to retrieve statistical information pertinent in planning. 3 lectures. Prerequisite: CRP 353.

**CRP 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results presented in a formal report. To be completed in two consecutive quarters. Minimum 120 hours time. Prerequisite: CRP 353.

**CRP 463 Undergraduate Seminar (2)**

Discussion and lectures on problems of professional practice in planning. Professional ethics. Students present organized material on some subject of interest. 2 seminars. Prerequisite: Senior standing in CRP.

**CRP 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CRP 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**CRP 472 Planning Colloquium (1) (CR/NC)**

Panel discussion by two or more faculty members and invited guests on controversial or topical planning related subject matter at campus and/or off-campus locations. Topics to be announced in advance by CRP Department. Maximum 6 units. Credit/No Credit grading. 1 seminar. Prerequisite: Upper division standing.

**CRP 500 Individual Study (2-3)**

Independent research, studies, or surveys of selected subjects. Total credit limited to 9 units. Prerequisite: Graduate standing with minimum of 12 core units.

**CRP 501, 502 Foundations of Urban and Regional Planning (4) (2)**

Historical and contemporary perspectives of urban and regional development and planning traditions and methodologies. Human settlements and natural environments as holistic systems and their interrelationships. Philosophy of planning. 4 lectures.

**CRP 505 Perspectives in Regional Planning (3)**

History, development and major philosophical approaches of regions and regional planning, both in urban-centered and resource-based regions. Effects of relaxing natural, economic and infrastructure limiting factors on growth and development of regions. Normative hierarchical emphasis of contemporary regional planning compared to emerging paradigms that alter the regional/local planning relationship. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CRP 510 Planning Theory (4)**

Theory of planning. Development of contemporary planning thought from varying sources and perspectives. Intensive study of planning literature. Alternative value systems and planning processes. Current approaches and philosophies in the United States and other countries. 4 seminars.

**CRP 513 Survey and Research Methods (3)**

Design and execution of field surveys, reduction of data to produce information for planning. 3 laboratories. Prerequisite: Graduate standing, STAT 251 or equivalent.

**CRP 515 Graphic Communication for Planners (3)**

Basic techniques used in graphic communication. Orthographic, isometric and perspective drawing. Introduction to various drawing media and delineation and presentation techniques for planners. Designed to develop three-dimensional visualization, graphic skills and basic proficiency in the exploration and communication of information and design ideas. 3 laboratories.

**CRP 516 Quantitative Methods in Planning (4)**

Problem recognition, data selection, analysis and synthesis with applications of system design, statistical techniques and symbolic modeling to urban design and regional growth and development policies. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

**CRP 520 Feasibility Studies in Planning (3)**

Base studies and economic development. Fiscal effectuation of policies and plans. Tax base and tax policies related to land use planning. Social accounting and overhead. Cost benefit studies and economic feasibility of plans. Long-range financial planning. Phasing and time scheduling. 3 seminars. Prerequisite: CRP 502 or equivalent.

**CRP 525 Plan Implementation (4)**

Zoning theory and legal background as a device to guide urban growth; the zoning ordinance, the districting plan. Subdivision regulations; the Capital Improvement program; mandatory referral; eminent domain; official plan lines; building, health, sanitation, housing and fire codes; grants administration. 3 lectures, 1 laboratory. Prerequisite: CRP 353 or consent of instructor.

**CRP 548 Philosophy of Urban Design (3)**

Introduction to the philosophy and theory particular to environmental design. Exploration of evaluation criteria and critical analysis of man's environment related to design and human needs. Spatial and form relationships, scale, human activities, concept formation, visual organization of the city, landscaping and architecture. 3 seminars.

**CRP 552, 553 Planning Laboratory (4) (4)**

Case study applications of planning theory and processes to urban and regional problems in increasing complexity. Interrelationships and impacts of economic and social conditions, technology, resource use, the natural and the built environments. Field trips. Individual, team and interdisciplinary approaches. 4 laboratories. Prerequisite: CRP 501, CRP 513, CRP 515.



**CRP 554 Advanced Planning Laboratory (4)**

Application of advanced theory and methods to the solution of complex micro and macro scale planning problems of spatial allocation and planning policy. Research, analysis, synthesis and implementation practice. 4 laboratories. Prerequisite: CRP 502 and CRP 553 or equivalent, CRP 420, CRP 510, CRP 516, CRP 525.

**CRP 570 Selected Topics in Planning (3)**

Directed group study of selected topics in planning theory. Total credit limited to 9 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**CRP 599 Thesis/Project (6)**

Individual research under the general supervision of the faculty, leading to a graduate thesis or project of suitable quality. Prerequisite: Advancement to candidacy.

**CRSC—CROP SCIENCE****CRSC 109 Principles of Agricultural Pest Management (4)**

Identification and control of common insect and vertebrate pests of agricultural crops and stored products. Safe use and handling procedures of insecticides, rodenticides, and avicides. Natural, cultural, mechanical, and chemical controls of injurious insects, mites, mammals, and birds. 3 lectures, 1 laboratory. Not open to agriculture or biological science majors.

**CRSC 123 Forage Crops (4)**

Production, harvest, utilization and value of important forage crops. Adaptation, identification and relative merits of grasses and legumes will be covered. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory.

**CRSC 131 Introduction to Crop Science (4)**

Production principles for field and vegetable crops. Fundamental botany, taxonomy and cultural practices. Soil tillage, fertilization, seed selection, planting and harvesting methods, irrigation, weed control, pest control, and crop rotation. Production practices for cotton. A field trip to a major California production area is required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Credit will not be allowed for both CRSC 131 and CRSC 230.

**CRSC 132 Grain Crops (4)**

Production, adaptation, distribution, and utilization of major grain crops harvested by combine, including wheat, barley, oats, corn, rice, sorghum, rye, triticale, and millets. Field trips to major California cereal production areas. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or CRSC 230.

**CRSC 133 Row Crops (4)**

Adaptation, production, processing, and utilization of major row crops such as potatoes, tomatoes, dry beans, and sugar beets. Field trip to a major California row crop production area required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or VGSC 230.

**CRSC 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**CRSC 221 Weed Control (4)**

Identification, life histories, and control of common, noxious, and poisonous California weeds. Weed control chemicals and equipment for cultivated crops, irrigation systems, range, wastelands. 3 lectures, 1 laboratory. Prerequisite: BOT 121 or CRSC 131 or FRSC 131.

**CRSC 230 General Field Crops (4)**

Production, harvest, and use of important cereal and field crops in California. Production areas, crop rotations, disease and pest control. 3 lectures, 1 laboratory. Credit will not be allowed for both CRSC 131 and CRSC 230.

**GEB F.2.**

**CRSC 231 Commercial Seed Production and Processing (4)**

Production and processing of certified and commercial seed including seed analysis, germination, quality control, cleaning and storage techniques, and seed laws. Field trip to a seed conditioning plant required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 132 or CRSC 133.

**CRSC 304 Plant Breeding (4)**

Application of principles of plant improvement through selection, hybridization, and utilization of hybrid vigor. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: BIO 303.

**CRSC 305 Advanced Weed Science (4)**

Classification and structure of herbicides; physiological processes affecting and affected by herbicides; mode of action; factors influencing herbicide performance; influence of plants and soil on the action of herbicides, symptoms of herbicide injury to plants; principles, development and application of biological means of weed control including the concept of allelopathy. Field trip to weed research areas required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 221 or consent of instructor.

**CRSC 311 Applied Insect Pest Management (4)**

Principles of controlling insect pests including biological, cultural, physical, mechanical, and chemical controls. Identification of insects injurious to California field, fruit, and vegetable crops including stored products and livestock. Insecticide formulation and methods of application. 3 lectures, 1 laboratory. Prerequisite: CHEM 121 or introductory courses in biology, botany or zoology or consent of instructor.

**CRSC 321 Advanced Insect Pest Management (4)**

Strategies, economics and case histories of insect pest management. Insect population monitoring and modeling. Insect identification. Field trips required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 311 or consent of instructor.

**CRSC 322 Crop Technology (3)**

Recent developments in technology relating to advancements in crop production under different cropping systems. 3 lectures. Prerequisite: CRSC 133, BOT 121 and junior standing.

**CRSC 327 Vertebrate Pest Management and Control (4)**

Vertebrate pests injurious to crops, livestock, other animals, stored products, and man. Life habits, identification, control methods, and materials. Related laws and regulations. 3 lectures, 1 laboratory.

**CRSC 330 Pasture and Processed Forage Crops (4)**

Three methods of producing, harvesting and utilizing forage species - grazing, haying and ensiling plant materials. Forage identification, hay grades and quality, preservatives to enhance quality, grazing systems, forage mixtures versus single species, problems to pasturing, the silage-making process and silo structures. Field trip to a production area required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 131 or CRSC 230 or consent of instructor.

**CRSC 333 Nutriculture (4)**

Development, practices, history, and future of crop production using nutrient solutions. Research application, commercial applications, production problems, marketing, and economics. Field trip to a commercial greenhouse operation required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CHEM 122, CRSC 133, SS 221 or consent of instructor.

**CRSC 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Any CRSC 100- or 200-level course or consent of department head.

**CRSC 410 Crop Physiology (4)**

Life processes of plants, such as photosynthesis and respiration, and the application of knowledge of these processes to crop production practices. 3 lectures, 1 laboratory. Prerequisite: CRSC 131, CRSC 230, FRSC 131, FRSC 230 or VGSC 230; and CHEM 328.

**CRSC 411 Experimental Techniques and Analysis (4)**

Principal methods of experimental design and analysis of collected data. Field practice in planning and layout with emphasis on management of agronomic and soils experiments. 3 lectures, 1 laboratory. Prerequisite: Junior or senior standing and MATH 103 or equivalent.

**CRSC 421 Oil and Fiber Crops (4)**

Culture, harvest, grading, and marketing of cotton, soybean, sunflower, safflower, and other oil and fiber crops. Field trips to major centers of production and marketing required. Miscellaneous course fee may be required— see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 133, CRSC 221 and BOT 121.

**CRSC 423 Tropical Crop Production (4)**

Production distribution, adaptation and utilization of major field and vegetable crops of economic importance in tropical and subtropical areas. 3 lectures, 1 activity. Prerequisite: CHEM 121 or CRSC 230 or consent of instructor.

**CRSC 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: CRSC 411 and LIB 101.

**CRSC 463 Undergraduate Seminar (2)**

Oral presentation and leadership of group study on recent developments in the major field. 2 seminars.

**CRSC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CRSC 521 Advanced Field Crop Production (4)**

Production and management of field crops under both intensive and extensive cultural practices; interaction between the various growth factors at various levels of production and interaction of cultural practices and plant requirements. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

**CRSC 525 International Intensive Farming Systems (4)**

Diverse and integrated agricultural methods with concentration on small- scale, intensive farms. Emphasis placed on international agricultural development for self-sufficiency and profit. Farm design, tools, fertilization, cropping systems, irrigation, crop production, storage and marketing. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

**CRSC 581 Graduate Seminar in Crop Production (3)**

Group study and oral reports on current technical problems and research results pertaining to field and vegetable crops production or marketing. 3 seminars. Prerequisite: Graduate standing.

**CSC—COMPUTER SCIENCE**

GEB F.1.

(Any CSC course except CSC 200, CSC 400, CSC 461, CSC 462, CSC 463, CSC 470, and all 500-level courses will satisfy GEB requirement F.1.)

**CSC 101 FORTRAN Programming I (2)**

Emphasis on programming techniques for mathematical analysis. Engineering and scientific applications. Credit not allowed for CSC majors. 2 lectures.

**CSC 110 Computers and Computing (3)**

Theoretical understanding of the computer and its auxiliary procedures and systems as intellectual tools, combined with the understanding of the breadth and significance of computer applications in American society, including a demonstrated ability to program in a high level language. Credit not allowed for CSC majors. 3 lectures.

**CSC 111 Introduction to Computer Applications for the Sciences (3)**

Fundamental concepts of computing; techniques for problem solving with computers; writing and running programs in BASIC; examples of applications and applications software drawn from the sciences. 2 lectures, 1 laboratory.

**CSC 112 Pascal Programming (3)**

Fundamental concepts of computing; techniques for problem solving with computers; writing and running programs in the programming language Pascal; hands-on experience with text editors and other programming support tools. Credit not allowed for CSC majors. 2 lectures, 1 activity.

**CSC 118 Fundamentals of Computer Science I (4)**

Introduction to programming skills: program structure, data types and structures, statements and control, procedures and function, text files, scope. Programming style and concepts: top-down design, stepwise refinement, structured programming and modularity. 3 lectures, 1 activity.

**CSC 120 Principles of Business Data Processing (4)**

Fundamental concepts of digital computing. Survey of computing devices, languages, methods and applications for business data processing. Credit not allowed for CSC majors. 4 lectures. Prerequisite: High school algebra.

**CSC 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**CSC 201 FORTRAN Programming II (3)**

Programming in extended Fortran language with emphasis on program efficiency and advanced features. Comparison of Fortran implementations. 3 lectures. Prerequisite: CSC 101 or CSC 118, and MATH 131 or MATH 141.

**CSC 203 COBOL Programming (3)**

Structure of the Common Business-Oriented Language (COBOL). Coding fundamentals and program logic. Writing of complete COBOL programs applied to typical business data processing problems. 3 lectures. Prerequisite: Any computer programming course.

**CSC 207 BASIC Programming (3)**

Advanced programming methods using the BASIC language. Language features, data types, file structures, error handling, and string processing. Structured programming and problem solving techniques in BASIC. 3 lectures. Prerequisite: CSC 110, CSC 118, or CSC 410 or consent of instructor.

**CSC 209 Selected Programming Languages (3)**

Language to be studied will be selected from high level programming languages or current interest and will be announced prior to registration for the quarter. Emphasis on language syntax and usage, and unique features. Intended for proficient programmers who want to learn another programming language. May be repeated to 6 units. 3 lectures. Prerequisite: CSC 118, CSC 218, CSC 221.

**CSC 218 Fundamentals of Computer Science II (3)**

Advanced programming skills. Emphasis on the development of algorithms, the utilization of classical algorithms, recursion, top down design, modularity, dynamic storage techniques and elementary data structures. 3 lectures. Prerequisite: CSC 118.

**CSC 219 Linear Programming (3)**

Introduction to linear programming, the simplex algorithm, duality, sensitivity and post optimal analysis. Use of linear programming techniques to solve linear optimization models. 3 lectures. Prerequisite: 6 units of college mathematics.

**CSC 221 Computer Principles and Programming (4)**

Introduction to assembly language programming and computer architecture. An introduction to the function of an assembler and the symbol table. Addressing modes and machine language formats. Techniques of assembly language programming. 3 lectures, 1 laboratory. Prerequisite: CSC 101 or CSC 118, and EL 219.

**CSC 222 Digital Computer Symbolic Programming (3)**

Advanced assembly language programming with emphasis on subroutine linkages and macrowriting. Introduction to I/O with emphasis on sequential files. 3 lectures. Prerequisite: CSC 221.

**CSC 245 Discrete Structures (3) (Also listed as MATH 245)**

Introduction to the discrete structures of computing. Turing machines; computer arithmetic; computability and algorithm complexity; recursion and recursive programming; concurrency and concurrent programming; induction; graphs, trees, state diagrams, and networks; elementary enumeration. 3 lectures. Prerequisite: CSC 118, EL 219, MATH 143.

**CSC 255 Computer Graphics Applications (4)**

For students who wish to learn to use computer graphics in their own disciplines. Plotter and interactive graphic display characteristics and programming. Use of computer graphics facilities. Introduction to interactive graphic display characteristics. Credit not allowed for both CSC 255 and CSC 455. 3 lectures, 1 laboratory.

**CSC 304 Introduction to Digital Computer Architecture (4)**

Comparative computer architecture and microprogramming of contemporary computer systems. Comparison of instruction set processors, addressing modes, input/output synchronization, and memory organization. 3 lectures, 1 laboratory. Prerequisite: CSC 340.

**CSC 306 Minicomputer Systems (4)**

Computer architectures involving 16-32 bit processors, macroassembly, linkage-editing, and the operating system interfaces to real-time and timesharing systems. Applications programming involving files, communications, floating-point hardware, and system utilities. 3 lectures, 1 laboratory. Prerequisite: CSC 118, CSC 221.

**CSC 309 Microcomputer Architecture and Programming (4)**

Comparison of architecture and instruction sets of microprocessors. Selection criteria and application of microprocessors. Use of application development aids. 3 lectures, 1 laboratory. Prerequisite: CSC 306.

**CSC 311 Numerical Engineering Analysis (3)**

Introduction to computer analysis techniques used in solving electrical engineering problems. Capabilities and limitations of various software packages used in electrical engineering. Numerical analysis techniques applied to linear and nonlinear electrical systems. Review of FORTRAN 77 for scientific programming. 3 lectures. Prerequisite: CSC 101, MATH 242, EE 212.

**CSC 331 Numerical Linear Analysis (3)**

Introduction to methods currently available to engineers, scientists and mathematicians for dealing with systems of linear equations utilizing a digital computer. Solutions of systems of linear equations, calculation of matrix inverses, pin jointed truss problem, curve fitting techniques. Applications to problems in engineering and science. 3 lectures. Prerequisite: MATH 133 or 143 and ability to program in FORTRAN.

**CSC 332 Numerical Analysis I (3)**

Computer solutions of nonlinear equations and systems of linear equations. Numerical integration and solutions of ordinary differential equations. 3 lectures. Prerequisite: MATH 143, CSC 101.

**CSC 333 Numerical Analysis II (3)**

Continuation of numerical quadrature and differential equations. Non-linear equations, spline and least-squares curve fitting techniques. Boundary value problems. 3 lectures. Prerequisite: CSC 332.

**CSC 340 Software Tools (4)**

Integrated software tools for developing and maintaining complex software systems. Introduction to system and program design methodologies. 3 lectures, 1 laboratory. Prerequisite: CSC 345.

**CSC 345 Data Structures (3)**

Basic data structures: arrays, records, simple linked structures, stacks, queues, linear lists, binary trees, sets and hashing. Abstract data types. Algorithms for internal sorting. Applications. 3 lectures. Prerequisite: CSC 218.

**CSC 346 File Structures (3)**

Principles of file organization. Sequential, indexed, hashed and tree organized files. Secondary indices. Data compression. Mass storage devices. File utilities. 3 lectures. Prerequisite: CSC 345.

**CSC 347 Introduction to Database Systems (4)**

Introduction to the basic methods and principles of database management systems (DBMS) and of application development using DBMS. Topics covered: DBMS objectives and architecture, database models, data definition and manipulation languages, query languages, database and application design, development tools. 3 lectures, 1 laboratory. Prerequisite: CSC 345.

**CSC 350 Discrete Dynamic Systems (3)**

Modeling, computer simulation and analysis of event-oriented dynamic systems involving random variables. Application of high level languages for discrete system simulation. Selected applications. 2 lectures, 1 laboratory. Prerequisite: CSC 118 or CSC 201, STAT 211 or STAT 321.

**CSC 351 Programming Languages I: Design (3)**

Comparison of structure and semantics of various high level programming languages. BNF grammars. Language implementation issues and techniques, including parameter passing, storage allocation and mapping and binding time. 3 lectures. Prerequisite: CSC 221, CSC 245, CSC 345.

**CSC 353 Computer Systems Programming (3)**

Design of assemblers, macroprocessors, and loaders. Advanced macrowriting and I/O programming. 3 lectures. Prerequisite: CSC 222, CSC 345.

**CSC 360 Continuous Dynamic Systems (3)**

Modeling, computer simulation and analysis of dynamic systems represented by ordinary differential equations. Applications of high level languages for continuous system simulation. Selected applications. 2 lectures, 1 laboratory. Prerequisite: CSC 201 and MATH 242.

**CSC 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with not more than 2 units in any one quarter. Prerequisite: Consent of department head.

**CSC 404 Telecommunications and Distributed Systems (4)**

Communications architectures and semantics of distributed systems; multicomputer complexes and interprocessor communications; communications media, message switching, and communications protocol standards. 3 lectures, 1 laboratory. Prerequisite: CSC 304, CSC 453 or consent of instructor.

**CSC 409 Microcomputer Systems (4)**

Continuation of CSC 309. Application programming, high level languages, and interfacing microprocessors. Introduction to 16-bit and 32-bit microprocessors. 3 lectures, 1 laboratory. Prerequisite: CSC 309.

**CSC 410 Computer Fundamentals for Educators (3)**

For students who plan to participate in the expanding role of computers in the field of education. Computer fundamentals, programming techniques, problem solving. Computers as teacher's aid and administrative tool. Program in BASIC. Credit not allowed for Computer Science majors. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**CSC 411 Advanced Programming for Educators (3)**

Intermediate and advanced techniques of programming in a high level language for microcomputers. Arrays, string processing, user defined functions, error trapping, subroutines, and files. 3 lectures. Prerequisite: CSC 110 or CSC 410 or consent of instructor.

**CSC 413 Authoring Languages (3)**

Introduction to the fundamental concepts of authoring languages. Survey of the attributes and applications of authoring languages pertaining to the developer and student user of such materials. 3 lectures. Prerequisite: CSC 410.

**CSC 414 Computer Assisted Instruction (3)**

Techniques of utilizing the computer to assist individualized instruction. Comparison with other methods of programmed instruction. Hardware and software requirements for computer-based training. Credit not allowed for CSC majors. 3 lectures. Prerequisite: CSC 110 or CSC 410 or consent of instructor.

**CSC 416 Computer Applications in School Administration (3)**

Applications of computer techniques to data processing and other management applications in the administration of schools and school districts. Credit not allowed for CSC majors. 3 lectures. Prerequisite: CSC 410.

**CSC 419 Mathematical Programming (3)**

Extensions of linear programming, introduction to nonlinear programming, dynamic programming and dynamic optimization procedures with industrial applications. 3 lectures. Prerequisite: CSC 219 and MATH 133 or MATH 143.

**CSC 420 Artificial Intelligence Survey (3)**

Survey of programs and techniques that characterize artificial intelligence. Programming in LISP and other languages. 3 lectures. Prerequisite: CSC 345 and CSC 351.

**CSC 421 Knowledge Based Systems (3)**

In-depth treatment of knowledge representation, utilization and acquisition in a programming environment. Emphasis on the use of domain-specific knowledge to obtain expert performance in programs. 3 lectures. Prerequisite: CSC 420.

**CSC 427 Computer Based Educational Systems (3)**

Introduction to the concepts of data management for dedicated applications in Computer Based Educational Systems (CBES). Emphasis on definition and designing of data management procedures and methods. Prerequisite: CSC 118, CSC 411.

**CSC 431 Numerical Analysis III (3)**

Numerical solutions of boundary value problems and partial differential equations. 3 lectures. Prerequisite: CSC 333.

**CSC 440 Software Engineering (3)**

Techniques for the production of computer based systems. Software tools, estimating techniques, project organization and control, documentation, and system specification for large programs. 2 lectures, 1 laboratory. Prerequisite: CSC 340.

**CSC 444 Health Information Systems (3)**

Their design, implementation, and applications including the evaluation of medical data as input to health care agencies' quality assurance systems for improving the quality of patient care and determining medical necessity. Credit not allowed for CSC majors. 3 lectures. Prerequisite: CSC 110 or CSC 410 or consent of instructor.

**CSC 445 Theory of Computing I**

Topics chosen from such areas of theoretical computer science as theory of automata (including cellular automata), formal language theory, computation theory, computational complexity, and program verification. 3 lectures. Prerequisite: CSC 450 or equivalent.

**CSC 447 Principles of Database Systems (3)**

Entity/relationship model, CODASYL DBTG network model and the ANSI/SPARC relational model. Relational model normalization theory. Transaction management: concurrency control and recovery. Query processing. Distributed databases. 3 lectures. Prerequisite: CSC 346, CSC 347.

**CSC 450 Programming Languages II: Description and Analysis (3)**

Regular languages and finite automata. Lexical analysis and parsing functions of compilers. Context-free languages and pushdown automata. Continuation of CSC 351. 3 lectures. Prerequisite: CSC 351.

**CSC 451 Programming Languages III: Compiler Implementation (3)**

Intermediate translation forms. Run time representations. Generation of object code for compilers. Optimization. Register allocation. Continuation of CSC 450. 3 lectures. Prerequisite: CSC 450.

**CSC 453 Introduction to Operating Systems (4)**

Introduction to sequential and multiprogramming operating systems; kernel calls, interrupt service mechanisms, scheduling, files and protection mechanisms, conventional machine attributes that apply to operating system implementation, virtual memory management, and I/O control systems. 3 lectures, 1 laboratory. Prerequisite: CSC 304, CSC 346, CSC 353.

**CSC 454 Kernels and Real-Time Programming (4)**

Design and implementation of multiprogramming kernels, systems programming methodology, inter-process communications, synchronization, device drivers and real-time programming. 3 lectures, 1 laboratory. Prerequisite: CSC 404 and CSC 453.

**CSC 455 Computer Graphics (4)**

Applications for interactive graphic display systems and XY plotters. Design characteristics of graphical input/output systems. Experience in programming interactive graphic display systems. 3 lectures, 1 laboratory. Prerequisite: CSC 345.

**CSC 456 Computer Graphics II (4)**

Algorithms for the implementation of 3-D simulations, animation, and computer aided design systems. Design and implementation of computer graphics systems. 3 lectures, 1 laboratory. Prerequisite: CSC 455.

**CSC 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time.

**CSC 463 Undergraduate Seminar (2) (CR/NC)**

Reports and discussions by students, based on their senior projects and on other topics relating to computer usage and programming which are of interest to persons preparing for a career in computer science. Offered only on a Credit/No Credit basis. 2 activity periods.

**CSC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**CSC 500 Directed Study (2-3) (CR/NC)**

Individual directed study of advanced topics. Total credit limited to 4 units. Credit/No Credit grading only. Prerequisite: Fully classified graduate standing and consent of instructor.

**CSC 501 Languages and Translators (4)**

Advanced programming language and translator concepts. Language concepts to be covered will be selected from current state-of-the-art languages and current issues in language design. Compiler concepts will include retargetable code generation, use of translator-writing systems, and error recovery. 4 seminars. Prerequisite: CSC 451.

**CSC 502 Database Systems (4)**

Topics in database systems: recovery, integrity, concurrency, security, data models, distributed databases, database machines, database system implementation, and semantic database design. 4 seminars. Prerequisite: CSC 347.

**CSC 503 Operating Systems (4)**

General concepts of computer architecture and operating systems. Design features of advanced computers, general time-sharing systems and schemes for dynamic memory allocation, scheduling and protection. Dynamic linkage between subroutines. Intercommunication between input/output and processors. 4 seminars. Prerequisite: CSC 453.

**CSC 504 Advanced Computer Architecture (4)**

Comparative study and design of multiprocessor, dataflow, RISC, high level language and other new computer architectures. VLSI processor design techniques. 3 seminars, 1 laboratory. Prerequisite: CSC 304, CSC 440, CSC 347, CSC 451, CSC 453.



**CSC 505 Theory of Computing II (4)**

Advanced topics in theoretical computer science from such areas as automata theory, cellular theory, computational complexity, and program verification. 4 seminars. Prerequisite: CSC 445.

**CSC 506 Artificial Intelligence (3)**

Advanced programming approach to the study of artificial intelligence. Experience in developing programming tools such as discrimination nets, pattern matching and agendas. Extensive programming in at least one AI language. 3 seminars. Prerequisite: CSC 420.

**CSC 507 Computer Simulation I (4)**

Principles and organization of simulation software. Executive programs for interactive control of continuous, discrete and combined system simulations. Integration with real time input and output. Event scheduling. Function generation. Data collection. Graphical display of simulation results. 4 seminars. Prerequisite: CSC 350 and CSC 360.

**CSC 517 Computer Simulation II (4)**

Selected topics in computer simulation methodology and applications: peripheral processors. Micro and mini computers in simulation. Specialized languages. Computer system performance analysis. Concurrent programming methods. Management of simulation projects. 3 seminars, 1 laboratory. Prerequisite: CSC 507.

**CSC 527 Advanced Computer Based Educational Systems (3)**

Principles of organization, components and methods used in Computer Based Educational Systems (CBES). Emphasis on the design and implementation of courseware using both low and high level languages. 3 seminars. Prerequisite: CSC 427.

**CSC 531 Numerical Methods I (4)**

Introduction for graduate engineering students to the methods used in numerical analysis. Numerical solutions to systems of linear and nonlinear equations; least squares methods; polynomial and cubic spline interpolation; numerical quadrature; solution of differential equations. 4 seminars. Prerequisite: CSC 201 and MATH 242.

**CSC 532 Numerical Methods II (4)**

High order predictor-corrector, Runge-Kutta, and extrapolation methods for initial value problems and stiff systems. B-splines for curve and surface fitting. Additional topics to be included according to the needs of the students. Review of the software packages available for numerical analysis. Prerequisite: CSC 531 or equivalent.

**CSC 559 Practicum in Computer Science I (1) (CR/NC)**

Preliminary planning and feasibility studies for the practicum projects of CSC 560. Credit/No Credit grading only. 1 activity. Prerequisite: Consent of instructor.

**CSC 560 Practicum in Computer Science II (5) (CR/NC)**

Documentation and solution of practical problems in computer science selected from business, industrial, and scientific organizations under guidance of lecturers from cooperating organizations and members of the computer science faculty. Credit/No Credit grading only. 1 seminar, 4 activities. Prerequisite: Consent of instructor.

**CSC 570 Advanced Topics in Computer Science (2-3)**

Directed group study of selected topics for graduate students. Topics will normally consist of continuations of those in CSC 501-CSC 506 and other topics as needed. *Class Schedule* will list topic selected. Topic credit limited to 9 units. 2 to 3 seminars. Prerequisite: Graduate standing and evidence of satisfactory preparation in computer science.

**CSC 590 Seminar in Computer Science (3)**

Current problems and research in the field of computer science through discussions and selected readings. Group study of selected advanced topics. 3 seminars. Prerequisite: Graduate standing.

**CSC 599 Thesis/Project (2-3) (2-3)**

Individual research or activity under faculty supervision leading to an acceptable thesis or project. Prerequisite: Graduate standing and consent of instructor.

## DANC—DANCE

### **DANC 111 Fundamentals of Movement (1)**

Theory and practice of fundamentals to promote ease and efficiency of movement. 1 activity.

### **DANC 131 Beginning Ballet (1)**

Fundamentals of ballet technique stressing alignment, turn-out, five basic positions and terminology. 1 activity.

### **DANC 132 Beginning Modern Dance (1)**

Fundamentals of modern technique stressing alignment, off-centered use of torso, floorwork, improvisation and composition. 1 activity.

### **DANC 133 Beginning Jazz Dance (1)**

Fundamentals of jazz dance technique stressing polyrhythms, body isolations, movement analysis. Performance of simple dance phrases. 1 activity.

### **DANC 134 Beginning Social Dance (1)**

Selected ballroom dances including the cha-cha-cha, fox trot, jitterbug, rumba, samba, tango, waltz and discotheque. Emphasis on alignment, etiquette, leading and following. 1 activity.

### **DANC 135 Folk Dance (1)**

Introduction to international folk dances, basic steps and formations, traditions and costumes. 1 activity.

### **DANC 140 Improvisation (1)**

Fundamentals of dance composition through improvisation and creative expression. 1 activity.

### **DANC 211 Orientation to Dance (3)**

Orientation to various aspects and types of dance integrated with brief history and theory. Course covers elements, techniques, styles, rhythms, creativity, composition and appreciation. 1 lecture, 2 activities.

### **DANC 231 Intermediate Ballet (2)**

Continuation of training in basic technical skills in ballet stressing phrasing, performance, and more complex step patterns. 2 activities. Prerequisite: DANC 131 or consent of instructor.

### **DANC 232 Intermediate Modern Dance (2)**

Continuation of training in basic technical skills in modern dance stressing phrasing, performance, and more complex step patterns. 2 activities. Prerequisite: DANC 132 or consent of instructor.

### **DANC 233 Intermediate Jazz Dance (2)**

Continuation of training in basic technical skills in jazz with an emphasis on more extensive movement vocabulary. 2 activities. Prerequisite: DANC 133 or consent of instructor.

### **DANC 234 Intermediate Social Dance (2)**

Continuation of DANC 134. Emphasis on variations, styles and performance skill. 2 activities. Prerequisite: DANC 134 or consent of instructor.

### **DANC 320 Dance Notation (3)**

Introduction to the major dance notation systems. Emphasizing Labanotation: theory, reading and writing. 1 lecture, 2 activities. Prerequisite: 100-level dance activity course or consent of instructor.

### **DANC 321 History of Dance (3)**

History of dance from prehistoric time to the present. 3 lectures.

### **DANC 340 Dance Composition (3)**

Further developmental principles of dance composition and improvisation. Exploring creativity through studies in use of various stimuli, process of construction, and structuring compositional forms. 1 lecture, 2 activities. Prerequisite: DANC 140, DANC 232 or DANC 233 or consent of instructor.

**DANC 345 Choreography (3)**

Directed experience in composition, choreography, reporting, and performance. Preparation for annual Orchestis concert and other performances. 1 seminar, 2 laboratories. Prerequisite: Audition or consent of instructor.

**DANC 346 Dance Production (3)**

Directed experience in production of annual Orchestis concert and other public performances. costuming, lighting, set design and rehearsals. 1 seminar, 2 laboratories. Prerequisite: DANC 345 in previous quarter or consent of instructor.

**DANC 381 Recreational Dance (3)**

Development of teaching techniques, methods, curricular materials and evaluation procedures as related to the teaching and learning of folk, social and square dance. 1 lecture, 2 activities. Prerequisite: DANC 211 or consent of instructor.

**DANC 382 Creative Dance for Children (3)**

Dance as a self-expressive medium for children with emphasis on movement exploration, rhythm, sensory awareness, kinesthetic skills and creative activity. 1 lecture, 2 activities. Prerequisite: 1 one-unit dance course or consent of instructor.

**DANC 383 Contemporary Dance Styles (3)**

Development of teaching methods, curricular materials, artistic principles and evaluation procedures related to the theory and practice of teaching contemporary dance styles to include jazz, modern, ballet basics, theatre dance and dance exercise. 1 lecture, 2 activities. Prerequisite: DANC 211 or consent of instructor and one dance activity course.

## DFA—DIETETICS AND FOOD ADMINISTRATION

**DFA 121 Fundamentals of Food (4) (Also listed as HE 121)**

Theoretical aspects and practical applications of the principles of food science and food preparation. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 three-hour laboratory. Prerequisite: CHEM 121.

**DFA 200 Special Problems for Undergraduates (1–2) (CR–NC)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit–No Credit grading only. Prerequisite: Consent of department head.

**DFA 210 Nutrition (3) (Also listed as HE 210)****GEB E.2.**

Nutrition as it relates to health throughout the life cycle, with emphasis on the young adult. 3 lectures.

**DFA 310 Maternal and Child Nutrition (3) (Also listed as HE 310)**

Nutritional requirements from conception to adolescence; role of nutrition in normal development. 3 lectures. Prerequisite: DFA 210.

**DFA 315 Geriatric Nutrition (3)**

Nutrition as it relates to the middle and later years, with emphasis on the elderly. 3 lectures. Prerequisite: DFA 210.

**DFA 321 Meal Management (3) (Also listed as HE 321)**

Factors and principles involved in the choice, purchase, and preparation of foods for a meal. Application of management principle in the use of time, energy, and money in relation to feeding the family. Planning, preparing, and serving meals with emphasis on nutritional, aesthetic, economic, and cultural aspects of food. 1 lecture, 2 two-hour laboratories. Prerequisite: DFA 121, DFA 210, HE 122 or consent of instructor.

**DFA 328 Advanced Nutrition (4)**

Human nutritional requirements. Factors affecting requirements. Biochemical and physiological functions of nutrients and their interactions in the body. Evaluation of nutritional status. Topics in nutrition research. 4 lectures. Prerequisite: DFA 210, CHEM 328, ZOO 300.

**DFA 348 Experimental Nutrition (2)**

Nutrient requirements and their evaluation. Quantitative laboratory techniques used in nutrition research. 2 three-hour laboratories. Prerequisite: DFA 328 or consent of instructor.

**DFA 400 Special Problems for Advanced Undergraduates (1-2) (CR-NC)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit-No Credit grading only. Prerequisite: Consent of department head.

**DFA 415 Methods of Teaching Nutrition (3) (Also listed as HE 415)**

Selection of valid content and learning activities for a variety of teaching situations and strategies in the classroom, community, or clinic setting. Writing of measurable objectives and the utilization of appropriate motivational and evaluation techniques. Activity designed to prepare students to teach nutrition at all stages of the life cycle. 2 lectures, 1 two-hour activity. Prerequisite: DFA 328, ED 305, and senior standing.

**DFA 416 Community Nutrition (3)**

Focus on community nutrition problems and methods of solving these problems. Government and private programs involved in the solutions. Development of skills in communication, assessment, and planning needed by the community nutritionist. 2 lectures, 1 two-hour activity. Prerequisite: DFA 415.

**DFA 421 Cultural and Aesthetic Aspects of Food (3) (Also listed as HE 421)**

Psychological, sociological, and economic factors that influence the formation of food habits and attitudes. Lab illustrates application of basic principles of food science to food consumption patterns of cultural groups. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 three-hour laboratory. Prerequisite: DFA 321 or consent of instructor.

**DFA 425 Quantity Food Preparation (3)**

Economic principles and problems involved in planning and preparing food using institutional equipment to meet specific product standards for large groups. 1 lecture, 2 two-hour laboratories. Prerequisite: DFA 321, senior standing, or consent of instructor.

**DFA 426 Food Systems Management (3)**

Principles of successful organization and management with their application to the effective operation of food service. Administrative responsibilities of the food service manager. Advance reservation with instructor required. 3 lectures. Prerequisite: DFA 321, senior standing, or consent of instructor.

**DFA 427 Equipment and Layout (3)**

Selection, maintenance, and arrangement of equipment and furnishings for food service departments with emphasis on materials, construction, and specifications. Designated field trips required. 2 lectures, 1 three-hour laboratory. Prerequisite: Senior standing or consent of instructor.

**DFA 429 Diet Therapy (4)**

Modification of normal food intake and dietary patterns, with emphasis on dietary adjustments necessitated by certain disease processes and conditions. 3 lectures, 1 three-hour laboratory. Prerequisite: DFA 348.

**DFA 440 Internship (1-12) (CR/NC)**

Career experience with private or public agencies. Total credit limited to 12 units. Credit/No Credit grading. Prerequisite: Junior standing and consent of instructor.

**DFA 461, 462 Senior Project (3) (3)**

Selection and completion of research related to the student's area of interest. Project requires a formal report which must follow departmental guidelines. Minimum of 180 hours required. Prerequisite: ENGL 215 or ENGL 218 required. Completion of 135 quarter units including all freshman, sophomore, and junior classes in major.

**DFA 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**DFA 471 Selected Advanced Laboratory (1-3)**

Directed laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. One 3-hour laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**DH—DAIRY HUSBANDRY****DH 101 Dairy Feeds and Feeding (2)**

Identification and classification of feeds; simple use of food nutrients, protein, fat, and carbohydrates; methods of preparing feeds; relative values of common feeds for each class of livestock with special attention to dairy cattle, the use of byproduct feeds. 2 lectures.

**DH 102 Feeding Dairy Cattle (2)**

Balancing dairy cattle rations. Feeding practices and nutritional requirements. 2 lectures. Prerequisite: DH 101, MATH 102.

**DH 121 Elements of Dairying (4)**

General information on statistics and opportunities in the dairy industry. Composition and food value of dairy products. Common tests to determine quality of products. Principles and practices of the feeding and management of dairy cattle. 3 lectures, 1 laboratory.

**DH 133 Fitting and Showing Dairy Cattle (2)**

Selection, preparation, presentation of dairy cattle for shows, sales, and photographing. 1 lecture, 1 laboratory.

**DH 142 Dairy Cattle Selection (2)**

Selection of dairy cattle with consideration to breed characteristics and conformation. Evaluation of type characteristics. Correlation between type and production. 2 laboratories.

**DH 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**DH 221 Milk Production (4)**

Factors affecting milk production. Dairy production problems and methods. Practice in many of the frequently used dairy production skills. 3 lectures, 1 laboratory. Prerequisite: DH 102, DH 121, DH 142.

**DH 222 Commercial Dairy Herd Management (4)**

Commercial dairy practices from the standpoint of cost of feeding and management. Visits are made to successful dairy farms. 3 lectures, 1 laboratory. Prerequisite: DH 221.

**DH 230 General Dairy Husbandry (4)****GEB F.2.**

Selection, breeding, feeding, and management of dairy cattle. Composition and food value of dairy products. Milk pricing, political influences, dairy industry statistics and opportunities. Producing and handling products. Course for other than dairy majors. 3 lectures, 1 laboratory.

**DH 233 Advanced Dairy Cattle Selection (2)**

Advanced practice in the comparative evaluation of dairy cattle. Detailed scoring and classifying cattle on conformation. Functional anatomy and relationship to production. Visits to breeding establishments and shows. 1 lecture, 1 laboratory. Prerequisite: DH 142.

**DH 301 Advanced Dairy Cattle Feeding (3)**

Nutrition requirements of dairy cattle. Successful, economical feeding practices, ration formulation utilizing the computer and desk calculators. 2 lectures, 1 activity. Prerequisite: DH 102 or ASCI 101 and computer literacy elective.

**DH 323 Breeds, Pedigrees and Management of Dairy Cattle (4)**

Origin of modern dairy cattle breeds, organization of cattle clubs. Breed families and herds. Practice in compiling pedigrees. Methods and problems in establishing and managing a purebred dairy herd. 3 lectures, 1 laboratory. Prerequisite: DH 221, DH 222.

**DH 330 Artificial Insemination (2)**

Techniques in the collection, evaluation and processing, storage of semen. Insemination procedures. Fertility problems. Record keeping. Endocrine control of reproduction. Embryo transfer. 1 lecture, 1 laboratory. Prerequisite: DH 121 or ASCI 121, VS 123 or VS 099.

**DH 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**DH 422 Breeding and Selection of Dairy Cattle (4)**

Evaluation of inherited characteristics in dairy cattle from an economic standpoint. Proving and selecting sires and dams. 3 lectures, 1 laboratory. Prerequisite: BIO 303, DH 142.

**DH 432 Advanced Dairy Herd Management (4)**

Dairy herd management skills needed in dairy operations. Instruction and lab experience in management, records, feeding and nutrition, herd health, milk secretion, reproduction, mating and selection. 3 lectures, 1 laboratory. Prerequisite: DH 301, DH 323, DH 330, and DH 422.

**DH 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**DH 463 Undergraduate Seminar (2)**

Reports on student papers, bulletins, periodical articles, and dairy research experiments. Sources of dairy husbandry information. Practice in oral reporting. Recent developments and research work in the dairy industry. 2 lectures.

**DH 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**DPT—DAIRY PRODUCTS TECHNOLOGY****DPT 133 Milk Processing and Merchandising (4)**

Composition and properties of fluid milk and its constituents. Equipment used to handle, process, and distribute fluid milk and related products. Product promotion, advertising and merchandising. 3 lectures, 1 laboratory. Prerequisite: DH 121.

**DPT 134 Dairy Processing Technology (4)**

Equipment and technology involved in manufactured dairy products, including butter, cheeses, ice cream, yogurt and concentrated dairy foods. 3 lectures, 1 laboratory. Prerequisite: DPT 133.

**DPT 220 Dairy Product Consumer Education (2)**

Consumer education in identification, selection, and nutritional value of dairy products. Comparison of dairy products with substitutes and imitations. Uses of dairy products in diets and home meal planning. Caloric values, chemical composition, and constituents of dairy products. 1 lecture, 1 activity.

**DPT 222 Frozen Dairy Foods (4)**

Selection of ingredients, calculating, and processing ice cream, ice milk, and sherbet mixes. Equipment and methods required to process, freeze, package, and harden ice cream and related products. 3 lectures, 1 laboratory. Prerequisite: DH 121.

**DPT 230 General Dairy Manufacturing (4)****GEB F.2.**

Composition and properties of fluid milk and manufactured milk products. Chemistry and microbiology of dairy products. Processes and equipment involved in the manufacture of butter, cheeses, and other fermented dairy products, frozen, condensed, and dried dairy foods. Elective course for nondairy students. Survey course for dairy husbandry majors. 3 lectures, 1 laboratory.

**DPT 326 Fermented Dairy Foods (3)**

Methods, ingredients, and equipment used in the manufacture of fermented dairy products, such as sour cream, buttermilk, and yogurt. Plant practice and field trips to study commercial applications. 2 lectures, 1 laboratory. Prerequisite: BACT 221.

**DPT 331 Condensed and Dry Milk (4)**

Processing, packaging, and marketing of evaporated and condensed milk and dry milk powders. Field trips are made to study commercial plants, methods and equipment. Mojonnier analysis and other routine tests. 3 lectures, 1 laboratory. Prerequisite: DPT 132, DPT 133.

**DPT 332 Dairy Inspection (3)**

California dairy codes and score cards used for dairy plants and farms. Quality tests of dairy products. Practice in inspecting and scoring dairy farms and factories. Organizational structure of inspection services. 2 lectures, 1 laboratory. Prerequisite: DPT 133, BACT 221.

**DPT 333 Dairy Foods Evaluation (2)**

Basic principles of sensory examination of dairy foods. Physiology of the various senses and their relationship to distinguishing the quality of dairy products by sight, flavor, body and texture. Product defects, causes, and methods of prevention. 1 lecture, 1 laboratory. Prerequisite: DPT 133.

**DPT 334 Cheese (2)**

Equipment and methods needed to manufacture, package, cure and market various types of cheese. Practice in the university creamery. 3 lectures, 1 laboratory. Prerequisite: Bact 221, DPT 133.

**DPT 336 Butter and Dairy Spreads (4)**

Equipment, ingredients, and methods needed to handle and manufacture various creams, butter, oleomargarine, and other dairy spreads. Practice in university creamery and field trips to observe commercial applications. 3 lectures, 1 laboratory. Prerequisite: DPT 133.

**DPT 433 Dairy Plant Management and Equipment (4)**

Basic management principles applied to the dairy industry. Industrial organization and control. Dairy plant location, design facilities and layout. Survey of financing applied to the dairy industry. Maintenance and operation of the equipment. 3 lectures, 1 laboratory. Prerequisite: PHYS 121 and consent of instructor.

**ECON—ECONOMICS****ECON 105 Consumer Economics (3)**

Consumer-producer relationships, money management, buying methods; investments, insurance, and housing; agencies that help the consumer. 3 lectures.

**ECON 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ECON 201 Survey of Economics (3)****GEB D.3.**

Basic material covered in Principles of Economics, ECON 211, 212 in a less detailed and technical manner. For majors requiring one quarter of economics. Not open to students with previous credit in ECON 211 or 212 or equivalent. 3 lectures. Prerequisite: Sophomore standing. Successful completion of ENGL 114 recommended.

**ECON 211 Principles of Economics (3)****GEB D.3.**

Macroeconomics: principles and applications in the theory of national income, output and employment. Determination and measurement of the national product; inflation; money, banking, monetary and fiscal policies. Not open to majors in Economics and Business. 3 lectures. Prerequisite: Sophomore standing. Successful completion of ENGL 114 recommended.

**ECON 212 Principles of Economics (3)**

Microeconomics: principles and applications in the theory of producer and consumer behavior, and the distribution of factor income with focus on the output market. Effect on the national economy. Not open to majors in Economics and Business. 3 lectures. Prerequisite: ECON 211 or consent of instructor.

**ECON 213 Principles of Economics (3)**

Principles and applications in macro and microeconomics; growth and development, comparative economic systems, international trade and current economic problems. 3 lectures. Prerequisite: ECON 211 and ECON 212 or equivalent.

**ECON 221 Microeconomics (4)**

Rigorous examination of microeconomic analysis. Marginal analysis as related to consumer, producer, and factor behavior in determination of prices and output. An in-depth study of microeconomic principles. Not open to students with credit in ECON 212 or equivalent. 4 lectures. Prerequisite: Sophomore standing. Successful completion of freshman mathematics and ENGL 114 recommended.

**ECON 222 Macroeconomics (4)****GEB D.3.**

Rigorous examination of macroeconomic analysis. Aggregate output, employment, prices, and economic policies for changing these variables. An in-depth study of macroeconomic principles. Not open to students with credit in ECON 211 or equivalent. 4 lectures. Prerequisite: ECON 221 and sophomore standing. Successful completion of freshman mathematics and ENGL 114 recommended.

**ECON 301 Introduction to Managerial Economics (3)**

Fundamental principles and analytical tools of economics useful in business decision making; applications to management through case study of actual business and managerial situations with microcomputer applications. 2 lectures, 1 laboratory. Prerequisite: CSC 120, ECON 212 or ECON 221 or consent of instructor.

**ECON 304 Comparative Economic Systems (3)****GEB D.4.b.**

Analysis of economic principles and institutions applicable to capitalism, socialism, and communism. 3 lectures. Prerequisite: One course in principles of economics.

**ECON 306 Applied Forecasting (4)**

Causes and measurement of business fluctuations. Techniques of forecasting with microcomputer applications. 3 lectures, 1 laboratory. Prerequisite: One course in principles of economics, CSC 120.

**ECON 311, 312 Intermediate Microeconomics (4) (4)**

Economics of prices and markets. Demand and supply. Returns and costs, factor pricing and income distribution, welfare and economic progress. 4 lectures. Prerequisite: One course in principles of microeconomics; MATH 221, MATH 222 or equivalent; STAT 251, STAT 252 or equivalent.

**ECON 313 Intermediate Macroeconomics (4)**

Economic activity related to production and resource use to meet goals of society. Income, employment, economic growth and progress of the United States and its regions. Application of theory with microcomputer simulation models. 3 lectures, 1 laboratory. Prerequisite: One course in principles of macroeconomics; CSC 120, MATH 221, MATH 222 or equivalent; STAT 251, STAT 252 or equivalent; ECON 337.

**ECON 314 Monetary and Fiscal Policies (4)**

National economic fluctuation models and related corrective monetary and fiscal policies on income, employment, output, growth and prices. Application of theory with microcomputer simulation models. 3 lectures, 1 laboratory. Prerequisite: ECON 313.

**ECON 317 Development of Economic Analysis (3)**

Analysis of ideas related to the development of economic theory in the Western civilization from the Greeks through the classical, neoclassical, and Keynesian to the current post-Keynesian concepts. 3 lectures. Prerequisite: Junior standing and satisfactory completion of ECON 211, ECON 212 or ECON 221, ECON 222 or consent of instructor.

**ECON 323 European Economic History (3)**

Analysis of the growth and development of economic institutions in the European economies from about 1600 to present. 3 lectures. Prerequisite: One course in principles of economics.



**ECON 324 American Economic History (3)**

Topical economic analysis of major events and institutions of American economic history as viewed against their causes, origin and development. Economic development of America from an underdeveloped nation. Agriculture, transportation, monetary and banking policies, business, labor, and growth of governmental activities. 3 lectures. Prerequisite: One course in principles of economics.

**ECON 325 Underdevelopment and Economic Growth (3)****GEB D.4.b.**

Economic development: the less developed world and the American interest. 3 lectures. Prerequisite: One course in principles of economics.

**ECON 330 Economics of Energy and Resources (3)**

Economic theory and public policies as applied to problems of natural resources and energy. Dynamic resource and energy models developed with reference to public and private sector growth. Application of the principles of capital theory emphasized. 3 lectures. Prerequisite: One course in principles of economics or consent of instructor.

**ECON 337 Money, Banking and Credit (4)**

Principles and practices of monetary, banking, and credit institutions as applied to business activity and public policy. 4 lectures. Prerequisite: One course in principles of macro-economics.

**ECON 339, 340 Econometrics (4) (4)**

Application of statistical methods useful in economics. General linear regression model. Specific issues and problems related to economic models: multicollinearity, autocorrelation, heteroscedasticity, dummy variables, lagged variables, and simultaneous equation estimation. Application and evaluation of selected examples of empirical economic research. Microcomputer applications. 3 lectures, 1 laboratory. Prerequisite: STAT 322, MATH 132 or MATH 143 or MATH 221, CSC 120, or consent of instructor.

**ECON 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ECON 401 International Trade (4)**

Theory of comparative advantage, gains from trade, and recent developments in trade theory; examination of tariffs, quotas, exchange controls, other trade barriers and underlying policy issues; review of U.S. commercial policy, GATT, the common market, regional and world economic organizations. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222 or consent of instructor.

**ECON 402 Public Finance (4)**

Principles of government financing and its various economic and social effects: collecting, spending and administration of public funds, particularly at state and local levels. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222 or consent of instructor.

**ECON 403 Industrial Organization (4)**

Application of basic tools of economics to American industry. Case studies of individual firms and industries. Performance of various business structures, such as monopoly and oligopoly. Effects of government regulation and antitrust policy. 4 lectures. Prerequisite: ECON 212, or ECON 221 or consent of instructor.

**ECON 404 International Monetary Economics (4)**

Nature of international payments, U.S. balance of payments. Theory and practice of foreign exchange rate determination under the gold standard, paper standard, and IMF system; international money and capital markets; problems of international liquidity and monetary stability. 4 lectures. Prerequisite: ECON 211, ECON 212 or ECON 221, ECON 222 or consent of instructor.

**ECON 410 Cost-Benefit Analysis (4)**

Principles of rational decision making with respect to business and government spending. Measurement of costs and benefits, interest rates, and criterion selection. Microcomputer applications. 3 lectures, 1 laboratory. Prerequisite: ECON 221 or ECON 212; ECON 311, ECON 312, CSC 120 recommended.

**ECON 413 Labor Economics (4)**

Wage determination theory, basic economic factors that affect the labor movement, economic impact of union activities on employment, output, income, wages, prices, and national economic policy. 4 lectures. Prerequisite: ECON 212 or ECON 221 or consent of instructor.

**ECON 430 Internship (2-8) (CR/NC)**

Placement of student for part-time supervised work experience in a business enterprise or government agency approved by the department head. Collateral reading correlated with work assignments and periodic written progress reports required. Credit/No Credit grading. Prerequisite: Junior standing.

**ECON 433 Transportation Economics (4)**

Analysis of the allocation of resources to the U.S. transport sector and specific transport modes as a result of their natural economic characteristics and public policy. 4 lectures. Prerequisite: One course in principles of economics.

**ECON 434 Urban Economics (4)**

Application of basic tools of economic analysis to problems of urban regions. Causes and possible cures for inadequate growth rate, income levels, and the quality of life in urban regions. 4 lectures. Prerequisite: One course in principles of economics.

**ECON 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time.

**ECON 463 Undergraduate Seminar (2)**

Seminar in applications of economic theory with emphasis on current problems. 2 seminars. Prerequisite: ECON 462.

**ECON 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

**ECON 500 Independent Study (1-3)**

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head.

**ED—EDUCATION****ED 104 Introduction to Art Materials (3) (Also listed as ART 104)**

Manipulation and experimentation with a wide variety of art media and techniques. Evaluation of expressive and design qualities in group and individual projects. 3 activities.

**ED 125 Efficient Reading (2) (CR/NC)**

Development of reading efficiency required in modern business, industry, and the professions. Credit/No Credit grading only. 1 lecture, 1 activity. Repeatable to a maximum of 4 units.

**ED 160 Personal Assessment I (2) (CR/NC)**

Introduce, demonstrate, and apply techniques that will enable students to develop practical study skills, investigate and assess academic, career, and personal goals, and improve cognitive processes. Credit/No Credit grading only. 2 lectures.

**ED 161 Personal Assessment II (2) (CR/NC)**

Expand the use of analytical thought, feelings, and creative imagery to explore the personal development of educational and career objectives. Resumé writing skills, interview skills workshops and mock interviews. Clarification of career/academic goals. Major-related internships and/or summer employment opportunities. Credit/No Credit grading only. 2 lectures. Prerequisite: ED 160.

**ED 300 Introduction to the Teaching Profession (3-6) (CR/NC)**

Supervised observation and participation six to twelve hours per week in cooperating schools. Tasks to acquaint the student with appropriate responsibilities of public school teachers. Total credit limited to six units. Credit/No Credit grading only.

**ED 301 Multicultural Education in Elementary School (3)**

Multicultural elements which influence learning and learning styles and the academic and social environment of the elementary school; examination of curricular materials in social studies and other subject matter areas. 2 lectures, 1 activity. Prerequisite: Junior standing or consent of instructor.

**ED 302 Multicultural Education in the Secondary School (3)**

Multicultural elements which influence the academic and social environment of the American secondary school; professional responsibilities and legal requirements; review of successful programs aimed at relieving tension created by cultural differences in rural and urban settings. 2 lectures, 1 activity.

**ED 305 Teaching and Learning Processes (3)**

Learning processes: selected theories of learning related to teaching; theories of human development and learning; psychological principles involved in the teaching-learning event; self-evaluation of the prospective teacher. 3 lectures.

**ED 322 Community Laboratory (1-3)**

Supervised learning experiences in cooperation with youth club activities, educational and community agencies. Application of knowledge and skills acquired in college classrooms. 1-3 activities. Total credit limited to 3 units. Prerequisite: Consent of instructor.

**ED 400 Special Problems for Undergraduates (1-3)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Junior or senior standing and consent of instructor.

**ED 401 Reading Methods in the Elementary School (3)**

Patterns of classroom organization, application of reading programs, approaches, modalities and methods in the elementary classroom. 3 seminars. Prerequisite: Advanced standing.

**ED 402 Field Experience in Elementary School Reading (3)**

Supervised field experience in the teaching of reading in a school setting. Seminars relating to case studies, observations and participation. 1 lecture, 2 activities. Prerequisite: ED 401. Taken immediately prior to preliminary student teaching.

**ED 403 Reading Methods in the Secondary School (3)**

Patterns of classroom organization, application of reading programs, approaches, modalities and methods in the classroom. 3 lectures. Prerequisite: Advanced standing.

**ED 404 Field Experience in Secondary School Reading (3)**

Supervised field experience in the teaching of reading in a secondary school setting. Seminars relating to case studies, observations and participation. 1 lecture, 2 activities. Prerequisite: ED 403. Taken immediately prior to preliminary student teaching.

**ED 405 Diagnosis, Prescription and Evaluation (2)**

Diagnosis of student learning problems. Prescription and direction of student learning programs. Evaluation of student achievement. 1 seminar, 1 activity.

**ED 406 Teaching the Adolescent (3)**

An exploration of factors relating to social and personal characteristics of the developing adolescent in the school. 3 seminars. Prerequisite: ED 305 or a course in introductory psychology or a course in adolescent development.

**ED 407 Teaching Language Arts in the Elementary School (3)**

Selection, organization and presentation of lessons in all areas of language arts communication, integration of other curriculum areas and language arts; cultural factors which influence language acquisition and learning English as a second language. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 activity. Prerequisite: ED 401. Taken immediately prior to preliminary student teaching.

**ED 408 Teaching Science and Social Studies in the Elementary School (3)**

Curriculum and methods in teaching science and social studies; selecting materials, organizing programs. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 activity. Prerequisite: ED 301.

**ED 409 Teaching in the Secondary School (3)**

Principles of effective teaching; instructional planning and related management techniques. 2 seminars, 1 activity. Taken immediately prior to preliminary student teaching. Prerequisite: ED 305, ED 403.

**ED 410 Preliminary Student Teaching (6)**

Part-time assignment in a classroom; includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor; assignment consists of an entire morning in the classroom (or the equivalent). Prerequisite: Completion of courses and requirements to preliminary student teaching and approval of campus screening committee for credential candidates.

**ED 411 Organization and Management in the Elementary School (3)**

Principles of motivation and discipline; classroom organization and management; daily, weekly and yearly planning for instruction; teaching styles. Miscellaneous course fee required—see *Class Schedule*. 2 seminars, 1 activity. Must be taken concurrently with ED 410.

**ED 420 Student Teaching (12)**

Full-time assignment in a classroom; includes teaching activities under the direction of a selected cooperating teacher in consultation with a university supervisor; assignment consists of an entire teaching day in the school for one quarter. Prerequisite: Completion of all courses and requirements prerequisite to full-time student teaching and approval by campus screening committee for credential candidates.

**ED 421 Senior Project—Practicum (Multiple Subjects) (2)**

Emphasis on solving problems related to field experience, refining of organizational and instructional strategies, including an interdisciplinary approach to curriculum; preparation for a job search; professional responsibilities and legal requirements; and development of a senior project on an education related topic. Miscellaneous course fee required—see *Class Schedule*. 2 seminars. Must be taken concurrently with ED 420 student teaching.

**ED 422 Student Teaching Practicum (Single Subjects) (3)**

Practices and problems of student teaching. Current innovations in teaching procedures and materials. Taken concurrently with single subject student teaching. 2 lectures, 1 activity.

**ED 440 Introduction to the Exceptional Individual (3)**

Characteristics of individuals with exceptional needs, implications for education; legal basis of educational adjustments; related current problems, trends, programs and community resources. 3 lectures.

**ED 441 Mainstreaming Strategies for Classroom Teachers (3)**

Procedures to enable the classroom teacher to respond appropriately to the exceptional child within the context of the total classroom. Includes assessment, IEP's, modification of curriculum and classroom management. 3 seminars. Prerequisite: ED 440.

**ED 442 Administration of Special Programs (3)**

Principles and practices of organizing and administering special education and other support programs; assessment and placement procedures appropriate to the individual child in need of specialized services. Enrollment in the Administrative Services Credential program is suggested but is not required. 3 seminars.

**ED 450 Classroom Management Strategies (3)**

Basic strategies for facilitating social-emotional techniques which shift disruptive behavior to appropriate behavior. 3 lectures. Prerequisite: Student teaching.

**ED 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ED 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate major adviser, and supervising faculty member.

**ED 501 Problems and Practices in Curriculum Development (3)**

Overview of major curriculum trends; planning and development of a comprehensive curriculum project geared to individual needs and interests. Emphasis on practicality. 3 seminars. Prerequisite: ED 407 or ED 408 or ED 409 or consent of instructor and graduate standing.

**ED 502 Early Elementary Curriculum and Methods (3)**

Objectives, methods and curriculum for the primary grades. Analysis of research and theory which give direction for teaching young children. Construction of instructional aids. 2 seminars, 1 activity. Prerequisite: Teaching experience.

**ED 503 Seminar in Language Arts Curriculum and Methods (3)**

Language arts curriculum: objectives, methods, content, materials, evaluation, current trends and research. 3 seminars. Prerequisite: Valid teaching credential and ED 407.

**ED 504 Seminar in Science Curriculum and Methods (3)**

Science curriculum: objectives, methods, content, materials, evaluation, current trends, and science program assessments. 3 seminars. Prerequisite: Valid teaching credential and ED 408.

**ED 505 Seminar in Social Studies Curriculum and Methods (3)**

In-depth study of the social studies curriculum: objectives, methods, content, materials, evaluation, current trends. 3 seminars. Prerequisite: Valid teaching credential.

**ED 506 Models of Instruction (3)**

Analysis of a wide variety of approaches to teaching that guide instruction in the classroom and in other educational settings. 3 seminars. Prerequisite: Valid teaching credential.

**ED 507 Instructional Materials (3)**

Provides the theoretical basis to examine, evaluate and integrate commercial and teacher-made supplemental materials into a standard curriculum. Develops the ability to construct teacher-made materials. Develops the ability to apply research techniques in evaluating the effectiveness of instructional materials. 3 seminars. Prerequisite: ED 585 or ED 582.

**ED 510 Educational Finance and Resource Allocation (3)**

Financing public schools in America: historical and current sources and types of funding. District level and site level funding and budgeting including priorities and purchasing procedures. Financial implications of personnel contracts and obligations. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ED 511 Educational Law and Governance (3)**

Legal aspects of school administration including unions, collective bargaining, and contract administration. Governing roles of federal, state, and local agencies including boards and district administrators. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ED 512 Educational Organization and Management (3)**

Organization and management of schools to maximize educational effectiveness. Principles of organization and their influence on productivity, principles of personnel management including staff motivation. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ED 513 Educational Leadership and Decision Making (4)**

Concepts of leadership and decision making in educational administration including administrators' responsibilities associated with roles in public schools. 3 seminars, 1 activity. Prerequisite: Graduate standing and consent of instructor.

**ED 514 School Site Administration (4)**

Principles and practices of effective building level administration in multicultural/multilingual environment. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**ED 515 Educational Program Management and Evaluation (3)**

Supervision, management, and evaluation of educational curriculum and educational programs. Current trends in program management including mapping, monitoring, alignment. 2 seminars, 1 activity. Prerequisite: ED 501, graduate standing, or consent of instructor.

**ED 516 Educational Personnel Management and Evaluation (4)**

Principles and processes for the supervision and evaluation of certificated and classified staff including legal, research, and professional considerations. 3 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

**ED 517 Organizational Development in Education (2)**

Administrator's role in group processes, including fundamentals of human relations and working with formal and informal groups. 2 seminars. Prerequisite: Graduate standing or consent of instructor.

**ED 518 Administrative Services Field Work (3)**

Supervised field work in school administration for supervision at the elementary and secondary level. Assignments must encompass an entire school year and must involve some multicultural experience. Repeatable to maximum of 12 units. Prerequisite: Admittance to the Administrative Services Credential program or consent of instructor.

**ED 525 Reading Process (3)**

Physiological, psychological and psycholinguistic components of the reading process. 3 lectures. Prerequisite: ED 401, ED 402 or ED 403, ED 404.

**ED 526 Diagnosing Reading Problems (3)**

Formal and informal methods of diagnosing reading problems in classrooms and reading clinics. 3 lectures. Prerequisite: ED 401, ED 402 or ED 403, ED 405 or consent of instructor.

**ED 527 Remediation of Reading Problems (3)**

Interpreting diagnostic results and prescribing remediation for specific reading problems within classrooms and special reading centers. 3 lectures. Prerequisite: ED 526.

**ED 528 Reading Programs (3)**

School reading programs and classroom organization. Application of research findings to teaching reading. Survey of innovative programs in elementary and secondary school reading. For teachers and supervisors. 3 lectures. Prerequisite: ED 401, ED 402 or ED 403, ED 405 or consent of instructor.

**ED 529 Teaching Reading to Bilingual Students (3)**

Principles, procedures and materials for teaching reading to bilingual students coupled with diagnostic and prescriptive methods for understanding reading problems of the bilingual student. 3 seminars. Prerequisite: ED 401 or ED 403.

**ED 530 Teaching Reading in the Secondary Schools (3)**

Principles, procedures, and materials for improving reading in the subject matter areas with students of different backgrounds and abilities in grades 7 through 12. 3 lectures. Prerequisite: ED 403, ED 404 or consent of instructor.

**ED 531 Supervision of Reading (3)**

Acquisition and application of the principles of supervision in a field setting by organizing, equipping and staffing classes; communicating with individuals and others employed in teaching reading; provide inservice programs and develop reading curriculum. 1 seminar, 2 activities. Prerequisite: ED 526, ED 527, ED 534 or consent of instructor.

**ED 532 Reading Field Work (3-6)**

Practical application of reading services in actual school classrooms, with assignments arranged to work within the setting of a school reading specialist. Weekly seminars with university staff included. Prerequisite: ED 526, ED 527, ED 534 or consent of instructor.

**ED 533 College and Adult Reading Practices (3)**

Supervised field experiences/activity in teaching reading to adults and college students in a college setting. Seminars relating to instructional procedures. 2 seminars, 1 activity. Prerequisite: ED 526, ED 527 or consent of instructor.

**ED 534 Advanced Clinical Experience in Reading (3-6)**

Supervised diagnosis and treatment of reading disability cases referred to the University by counselors, parents, teachers, and pupils themselves. Weekly interviews with school students, and seminars for discussion and analysis of current cases. Prerequisite: ED 526, ED 527 and consent of instructor.

**ED 540 Guidance Services for Exceptional Students (3)**

Fundamental guidance techniques for teachers working with exceptional individuals and their families; problems affecting the personal, educational and social adjustment of individuals with exceptional needs. 3 seminars. Prerequisite: Admission to Special Education Program or consent of instructor.

**ED 541 Resource Specialist (3) (3)**

Consulting functions. Coordinating functions. Development of skills to provide consultive services to teachers, administrators, and parents of handicapped; instructional strategies, curricular modification, utilization of community resources. Legislation and regulations, coordination skills, implementation of the IEP, instructional programs. 2 seminars, 1 activity. Prerequisite: Acceptance into Special Education Program or valid Special Education Credential.

**ED 545 Teaching Strategies for the Learning Handicapped (3)**

Instructional strategies; current methodology and techniques of curriculum modification necessary to individualize instructional activities for the learning handicapped student. 3 seminars. Prerequisite: ED 440 and admission to Special Education Program, or consent of instructor.

**ED 546 Teaching Strategies for the Severely Handicapped (3)**

Instructional strategies; current methodology and techniques of curriculum modification necessary to individualize instructional activities for the severely handicapped student. 3 seminars. Prerequisite: ED 551.

**ED 547 Atypical Learning Patterns (3)**

Theoretical considerations of learning patterns deviating from normal development. Educational implications of the integrative function of motor, sensory and perceptual abilities of learning disabled individuals. 3 seminars. Prerequisite: ED 440 and ED 545.

**ED 548 Career Development of Exceptional Persons (3)**

Career selection, preparation and social adjustment, community attitudes and legal requirements for individuals with handicapping conditions. Observation and field work required. 2 seminars, 1 activity. Prerequisite: ED 440 or consent of instructor.

**ED 550 Assessment of the Exceptional Student (3)**

Use of standardized tests and other assessment devices for the identification of learning and behavioral patterns of exceptional pupils. Includes assessments of physical, intellectual, social and emotional behavior. 3 seminars. Prerequisite: Advanced standing.

**ED 551 Characteristics of the Severely Handicapped (3)**

Characteristics, identification procedures, causation, needs, legal issues, community attitudes, educational and social programs for severely handicapped person. 3 seminars. Prerequisite: ED 440.

**ED 553 Current Issues in Special Education (3)**

Consideration of assumptions and techniques of educational research regarding the educational, personal, social and vocational difficulties affecting the development of individuals with exceptional needs; emphasizing their applicability to general and specific educational programs. 3 seminars. Prerequisite: Admission to Special Education Program or consent of instructor.

**ED 554 Advanced Practicum in Special Education (1-12)**

Directed teaching activities with students with exceptional needs in public school programs, integrating and demonstrating competencies of candidates for the Specialist Credential. Scheduled seminars. Prerequisite: Admission to Special Education Specialist Credential Program, ED 540, ED 545, ED 547, ED 550.

**ED 555 Introduction to Counseling (3)**

Overview of the counseling profession, underlying philosophical and theoretical concepts and ethics. Emphasis on developing communication skills. 3 seminars. Prerequisite: Graduate standing.

**ED 556 Minority Counseling (3)**

Socio-psychological concepts of the visible ethnic experience. Effects of poverty and the significance of oppression. Counseling and guidance techniques, parent involvement, and community relations. 3 seminars. Prerequisite: ED 555.

**ED 557 Career/Community Resource Utilization (3)**

Counselor role in information dissemination, and as a community resource and referral agent. Includes sources of occupational/educational information, computerized retrieval systems, career choice theory and career counseling. 3 seminars. Prerequisite: Graduate standing.

**ED 558 Appraising Career Development (3)**

Appraisal procedures and theory in career guidance and counseling. Synthesis of personal and social data to diagnose and predict career development and choice. 3 seminars. Prerequisite: PSY 432.

**ED 559 Academic Counseling (3)**

Effective procedures in teaching and counseling to increase the academic and test taking performance of students. 2 seminars, 1 activity. Prerequisite: Graduate standing or consent of instructor.

**ED 560 Counseling Theories (3)**

Variety of theoretical concepts in counseling as applied to an individual's personal, educational and career needs. 3 seminars. Prerequisite: ED 555, PSY 307.

**ED 561 Group Guidance and Counseling (3)**

Principles of group counseling, theories, ethics, research and evaluation with emphasis on communication skills, process, development and task orientation. 3 seminars. Prerequisite: ED 555.

**ED 562 Student Development-Higher Education (3)**

Exploration of the roles and competencies of the student development specialist in higher education. Review of relevant developmental theory with emphasis on practical implementation. 3 seminars. Prerequisite: Graduate standing.

**ED 563 Student Affairs in Higher Education (3)**

Explores current issues and trends in higher education, historical and organizational framework and implications for student development. 3 seminars. Prerequisite: Graduate standing.

**ED 564 Consultation, Ethics and the Law (3)**

Program and staff development needs assessments, program development and evaluation. Consultation and organizational development models and skills. Ethics, client rights and laws related to counseling. 3 seminars. Prerequisite: ED 555.

**ED 565 Diagnosis and Treatment Planning (3) (Also listed as PSY 565)**

Review of formal and informal methods of assessment. Application of diagnostic models including DSM III to case studies, choice of appropriate intervention, development of treatment plan, and assessment of client change. Methods of documentation of assessment, diagnosis, treatment plan and evaluation. 3 seminars. Prerequisite: ED 555, ED 560, PSY 432, PSY 307.

**ED 566 Advanced Group Counseling (3)**

Application of counseling theory, therapeutic intervention, ethics, leadership and principles to specific developmental and process groups. 2 seminars, 1 activity. Prerequisite: ED 555 and ED 561. May take ED 560 concurrently.



**ED 567 Counseling the Elderly (3)**

Understanding of the dynamics of old age as applied to counseling. Includes the application of physiological, informational, psychological, crisis and non-white concerns with a required practicum. 2 seminars, 1 activity. Prerequisite: ED 555, and HD 425 or PSY 459.

**ED 568 Cognitive Behavioral Counseling (3)**

Theory and application of cognitive restructuring approaches in counseling. Includes cognitive learning approaches, coping, problem solving and decision making skills. 3 seminars. Prerequisite: ED 555, ED 560 and PSY 458.

**ED 569 Practicum in Counseling (3)**

Counseling experience under direct supervision in the Counseling and Guidance Clinic. Emphasis on integration of information and theory with applied counseling techniques and strategies. Weekly seminars with staff. Prerequisite: ED 555, ED 560, HD 450.

**ED 570 Nonsexist and Relationship Counseling (3)**

Review of anthropological, social and psychological antecedents to sex role stereotyped expectations, implications for education, career, relationships and parenting. Nonsexist counseling strategies, couple therapy, and introduction to sex therapy. 3 lectures. Prerequisite: ED 555, HD 450.

**ED 571 Advanced Marriage, Family and Child Counseling (3)**

Application of the theories of marriage, family and child counseling. Informal and formal assessment systems, structural and strategies approaches emphasized. Sex therapy and ethics. 3 lectures. Prerequisite: HD 450, ED 555.

**ED 572 Child Counseling and Therapy (3)**

Assessment, diagnosis, treatment planning, evaluation and documentation of case studies of children with emphasis on developmentally appropriate individual and group interventions. Effective parenting strategies will be reviewed. 3 seminars. Prerequisite: ED 555, PSY 307, PSY 456.

**ED 573 Field Experience, Counseling (3-12)**

Practical application of guidance services and counseling in public schools, colleges and community settings. Weekly seminars with university staff included. Prerequisite: Consent of counseling coordination one quarter prior to enrollment.

**ED 581 Graduate Seminar in Education (1-3)**

Contemporary problems in education. Trends, developments, and issues. Total credit limited to 9 units. Prerequisite: Graduate standing.

**ED 582 Investigative Techniques (3)**

Principles and methods of applying appropriate designs and statistical analysis to research in counseling and education. 3 lectures. Prerequisite: College level mathematics.

**ED 585 Research Methods in Education (3)**

Develop the student's ability to compare and contrast a variety of educational research methods, and to implement a project which demonstrates the student's knowledge of research methodology. 3 lectures. Prerequisite: Master's degree candidate or consent of instructor.

**ED 586 Group Processes in Education (3)**

Task-oriented groups in educational and community settings. Personal development, leadership and membership roles, values and decision-making productivity models and strategies. 3 lectures. Prerequisite: Master's degree candidate or consent of instructor.

**ED 587 Educational Psychology (3)**

Understanding the learning environments which will accommodate the range of learners in the schools. Combining process, concepts, theories, materials, and media in order to promote motivation and achievement. 3 lectures. Prerequisite: ED 305, equivalent course, Master's degree candidate or consent of instructor.

**ED 588 Cultures, Communities, and Education (3)**

Historical analysis of the many socio-economic, cultural, and politico-judicial traditions influencing present educational conditions in America. Trans-disciplinary perspective of the pluralistic society in both metropolitan and rural environments. 3 lectures. Prerequisite: Master's degree candidate or consent of instructor.

**ED 599 Thesis or Project (3) (3)**

Completion of a thesis or project pertinent to the field of education. Students must enroll every quarter in which advisement is received. Prerequisite: Consent of graduate committee and supervising faculty member(s).

## **EDES—ENVIRONMENTAL DESIGN**

**EDES 101 Introduction to Architecture and Environmental Design (2) (CR/NC)**

Familiarization with the professional fields of architecture, landscape architecture, structural engineering, construction, and city planning. Introduction to the school's programs as they relate to individual aptitudes. The design process. Visiting speakers. Credit/No Credit grading. 2 lectures.

**EDES 110 Descriptive Drawing (1)**

Exercises in drawing without mechanical aids. Total credit limited to 3 units. 1 laboratory.

**EDES 111 Introduction to Drawing and Perspective (3)**

Basic techniques used in graphic communication. Orthographic and isometric projection. Mechanical perspective, shades and shadows. 3 laboratories.

**EDES 112 Basic Graphics (3)**

Drawing as a communication tool in the environmental design fields. Exercises to develop basic skills and speed in the representation of ideas. Use of various drawing media. 3 laboratories. Prerequisite: EDES 110, EDES 111, or consent of instructor.

**EDES 113 Graphics (6)**

Covers material in EDES 111 and 112. Primarily for transfer students. Partial credit may be granted. 6 laboratories.

**EDES 201, 202 Environmental Design Fundamentals (3) (3)**

Elements of visual perception. Theories of environmental design. Program development. Analytic techniques and problem solving methodologies. Behavioral and social implications of environmental design decisions. Projects in the environmental context. 3 laboratories. Prerequisite: EDES 101, EDES 112.

**EDES 210 Advanced Descriptive Drawing (2)**

Advanced programs in descriptive drawing as continuation of EDES 110. 2 laboratories.

**EDES 250 Computer Applications (2)****GEB F.1.**

Introduction to the application of computers in architecture. 1 lecture, 1 laboratory.

**EDES 251 Digital Computer Applications (1)**

Introduction to the application of computers in architecture. 1 lecture.

**EDES 301 Environmental Impact Reporting (3)**

Systematic and interdisciplinary methodologies for information handling and transfer for decision making in environmental development. Public concerns, participation and legal implications. Problem areas. 3 lectures. Prerequisite: Third-year standing.

**EDES 303 Human Factors for Environmental Designers (3)**

Integrated approach to development of systematic design programs. Developing and interpreting human factors design criteria, performance and satisfaction as a function of environmental factors, determining and assessing user preferences, methods of field observation and analysis. 3 lectures. Prerequisite: Second-year standing in School of Architecture and Environmental Design or consent of instructor.

## EE—ELECTRICAL ENGINEERING

### EE 110 Orientation (1)

Familiarization with the field of electrical and electronic engineering. 1 lecture.

### EE 112 Basic Circuit Analysis (2)

Introduction to basic circuit analysis. Resistive circuits, voltage and current sources, network theorems, op-amp circuits. 2 lectures. Prerequisite: MATH 142 or equivalent.

### EE 200 Special Problems for Undergraduates (1-2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### EE 201 Electric Circuit Theory (3)

Application of fundamental circuit laws and theorems to the analysis of dc, and steady-state single-phase and three-phase circuits. For engineering majors except electronic/electrical. 3 lectures. Prerequisite: MATH 242, PHYS 133.

### EE 211, 212 Basic Electric Circuit Analysis (3) (3)

Continuation of basic circuit analysis. Energy storage elements, RC and RL circuits, phasors, ac power, 3-phase circuits, forced and natural response, transient and steady-state analysis, complex frequency and magnetically coupled circuits. 3 lectures. Prerequisite: MATH 143 and EE 112 for EE 211; MATH 242 (or concurrent) and EE 211 for EE 212.

### EE 241, 242 Basic Circuits Laboratory (1) (1)

Use of electrical and electronic test equipment. Experimental verification of circuit analysis concepts including Kirchhoff's Laws, Thevenin's Theorem, maximum power transfer and superposition. Observation of transient and steady-state phenomena, phase-shift circuits, resonance. Use of phasor diagrams. 1 laboratory. Concurrent or prerequisite: EE 211, EE 212.

### EE 261 Electric Circuits Laboratory (1)

Techniques of measurement of dc and steady-state ac circuit parameters. Equivalent circuits, nonlinear elements, resonance. 1 laboratory. Concurrent or prerequisite: EE 201.

### EE 301 Network and System Analysis (3)

Fourier analysis. Fourier and Laplace transform applications. Transient analysis. Transfer functions. Two-port parameters, pole-zero locations and system response. Development and use of Bode plots. 3 lectures. Prerequisite: EE 212, MATH 317.

### EE 302 Linear Control Systems (3)

Automatic feedback control systems. Analysis of linear dynamic systems. 3 lectures. Prerequisite: EE 301.

### EE 303 Power Transmission (3)

Electrical characteristics of three-phase overhead and underground power transmission lines. Development of models for different types of lines as well as interconnected power systems. Introduction of per unit calculations. Introduction of computer simulation methods. 3 lectures. Prerequisite: EE 301.

### EE 325 Energy Conversion Electromagnetics (3)

Fundamentals of electro-mechanical energy conversion. Magnetic circuits and electromagnetic devices. Theory of operation and operating characteristics of transformers, dc machines, ac induction machines, and synchronous machines. Stepper motors. 3 lectures. Prerequisite: EE 201 or EE 212 and PHYS 133 or EL 207.

### EE 341 Advanced Circuits Laboratory (1)

Fourier analysis. Two-port networks, pole-zero locations and Bode plots. 1 laboratory. Concurrent or prerequisite: EE 301.

### EE 342 Control Systems Laboratory (1)

Laboratory work in feedback control systems. 1 laboratory. Concurrent or prerequisite: EE 302, EE 341, EE 365.

**EE 365 Energy Conversion Laboratory (1)**

Single-phase and three-phase transformers. Starting of rotating machines, evaluation of characteristics of rotating machines. 1 laboratory. Concurrent or prerequisite: EE 325.

**EE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**EE 406 Power System Analysis I (4)**

Introduction to electric power systems. Representation of power systems and components. One line diagrams and per unit calculations. Power limits and stability, system model representation of the synchronous machine, symmetrical faults, electrical insulation, grounding. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 303.

**EE 407 Power Systems Analysis II (4)**

System protection, relays and relay systems, faults, load flow calculation, computer solutions, power system instrumentation and measurement techniques. Solution of power system problems by microcomputer techniques and time-share methods. 4 lectures. Prerequisite: EE 406.

**EE 410 Power Control I (4)**

Power semiconductor devices. Theory of power diodes, SCR, Triac, MOSFET, HEXFET, Diac, Unijunction transistor, etc., modeling of diode and SCR circuits, SCR trigger circuits, analysis of SCR circuit in rectifiers, choppers and dc motor control. 3 lectures, 1 laboratory. Prerequisite: EE 325, EL 309.

**EE 411 Power Control II (4)**

Analysis of SCR circuits in inverters and cycloconverters; modeling of inverter-induction motor drive system; regenerative braking; electric propulsion; digital computer study of motor control system. Line commutated inverters and HVDC converters, phase-locked loops and microprocessor based control systems. 3 lectures, 1 laboratory. Prerequisite: EE 410.

**EE 414 Direct Energy Conversion (3)**

Direct energy conversion, and storage, with consideration of resources, batteries, fuel cells, thermoelectricity, thermionic generators, solar energy, cells, MHD, power generation, and related topics. 3 lectures. Recommended as a complement to ME 415. Prerequisite: ME 302.

**EE 417 Alternating Current Machines (4)**

Alternating current machines. Generalized, operational and dynamic analysis. Steady-state and transient operation of synchronous machines and linear induction machines. 3 lectures, 1 laboratory. Prerequisite: EE 325, 365.

**EE 432 Control Systems Engineering (3)**

Advanced course in analysis and design of control systems based on root-locus, frequency domain and computer approach. Nonlinear sampled data and self-adaptive systems. 3 lectures. Prerequisite: EE 302 or consent of instructor.

**EE 444 Power Systems Laboratory (1)**

Protective relaying, coordination, and relay calibration. Power control using transformers, parallel operation of generators, and computer simulation of power systems. 1 laboratory. Prerequisite: EE 406.

**EE 461, 462 Senior Project (3) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required—see *Class Schedule*. Minimum 150 hours total time. Prerequisite: EE 325, EL 309, EL 334.

**EE 463 Undergraduate Seminar (2) (CR/NC)**

Discussion of new developments in the fields of power systems and control. Fields of employment and job considerations. Credit/No Credit grading. 2 seminars. Prerequisite: Senior standing.

**EE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**EE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**EE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**EE 511 Electric Machines Theory (3)**

Advance topics in electric machines theory. Introduction to Park's transformation. Analysis of electric machines using Kron's generalized concept. Excitation systems. 3 seminars. Prerequisite: EE 325 or equivalent, graduate standing or consent of instructor.

**EE 513, 514 Control Systems Theory (3) (3)** *HAROLD*

State variables of open loop and closed loop dynamic systems. Mathematical modes. Concepts of sensitivity, controllability and observability. Discrete control. Selected topics such as stability by Lyapunov's functions; adaptive and optimal control; Bellman's dynamic programming and Pontryagin's maximum principle; random processes and stochastic control. 3 seminars. Prerequisite: EE 302 or equivalent, graduate standing or consent of instructor.

**EE 518 Advanced Power System Analysis (3)**

Symmetrical components. Unbalanced faults. Analysis by digital computer simulation. Load flow studies. Elements of power system stability. 3 seminars. Prerequisite: EE 406 or equivalent, graduate standing or consent of instructor.

**EE 519 Power System Design (4)**

Design studies involving aspects of an electric power system. Current industrial designs. Computer simulation techniques used extensively. 4 seminars. Prerequisite: EE 518, graduate standing or consent of instructor.

**EE 520 Solar-Photovoltaic Systems Design (3)**

Solar cell and storage battery theory, examination of insolation variability and optimization techniques, principles of grounding protection and control, a survey of power conditioning equipment and system integration techniques. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**EE 525 Stochastic Processes for Engineers (3)** *TAUPOON*

Stochastic processes used in the solution of engineering problems. Stationary processes and power spectra; Gaussian processes, Poisson processes, Markov and Semi-Markov processes. Applications to the problems of filtering and prediction (Wiener & Kalman filters), and to the problems of queuing traffic congestion, flow of material and equipment in a system. 3 seminars. Prerequisite: EL 414 or equivalent, graduate standing or consent of instructor.

**EE 527 Advanced Network Theory (3)**

Circuits, matrices, and linear vector spaces; linear graph theory; state equations for linear networks in normal form; eigenvalues and eigenvectors; reciprocal networks; normal modes. 3 seminars. Prerequisite: EE 301 or equivalent, graduate standing or consent of instructor.

**EE 563 Graduate Seminar (1)**

Current developments in the fields of electrical and electronic engineering. Participation by students, faculty and guest lecturers. Open to graduate students with a background in electrical or electronic engineering. 1 seminar. Total credit limited to 3 units.

**EE 570 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**EE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the requirement for the degree. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

## **EL—ELECTRONIC ENGINEERING**

**EL 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**EL 207 Introduction to Electric and Magnetic Fields (3)**

Fields and potentials associated with and the forces between static point charges and point current elements. Generalization from point charges and point current elements to line, surface, and volume distributions of charge and current. Field mapping of electric and magnetic fields. Magnetic circuits. Resistance, capacitance and inductance. 3 lectures. Prerequisite: PHYS 131, MATH 143; EE 211 prerequisite or concurrent.

**EL 208 Electronic Devices (3)**

Internal operation, terminal characteristics, and models of diodes, transistors (bipolar and field-effect), and optical devices (LED's and phototransistors). 3 lectures. Prerequisite: EL 207, EE 211, and PHYS 211.

**EL 219 Logic and Switching Circuits (3)**

Modulo-N arithmetic and digital coding techniques. Fundamentals of Boolean Algebra and minimization techniques. Multiple function synthesis using ROM's and PLA's. Combinational circuit design as it applies to computers. Sequential circuit elements, flip-flops, counters and shift-registers. 3 lectures. Prerequisite: CSC 101.

**EL 248 Electronic Devices Laboratory (1)**

Experimental determination of device characteristics and models. 1 laboratory. Concurrent: EL 208.

**EL 303 Signal Transmission (3)**

Distributed-circuit concepts and traveling waves. Transmission line parameters. Lines with and without reflection. Standing waves. Smith Chart and its applications. Transmission line measurements and impedance matching techniques. 3 lectures. Prerequisite: EE 301.

**EL 307 Digital Integrated Electronics (3)**

Integrated logic circuits: RTL, DTL, TTL, I<sup>2</sup>L, ECL, MOS, CMOS, interfacing different logic families. 3 lectures. Prerequisite: EL 208, EL 219. Concurrent: EL 347.

**EL 308 Electronic Circuits (3)**

Analysis and design of linear small-signal amplifiers. 3 lectures. Prerequisite: EL 208, EE 302 and EL 348 concurrent.

**EL 309 Integrated Electronic Circuits (3)**

Analysis and design of feedback amplifiers; operational amplifier applications. Design of analog/digital and digital/analog converters. Power supply design. Emphasis on IC implementation. 3 lectures. Prerequisite: EE 302, EL 308. Concurrent: EL 349.

**EL 319 Digital System Design (3)**

Introduction to finite automata theory and the design of digital systems utilizing state-machines, analysis and synthesis of state-machines. Design of synchronous, asynchronous, and pulse mode sequential circuits. Role of the microprocessor in implementing state-machines. Trade-offs between system design utilizing hardware, firmware and microprocessors. 3 lectures. Prerequisite: EL 219, EL 307.

**EL 321 Electronics (3)**

Semiconductor devices and circuits. Instrumentation amplifiers, power control rectifiers, feedback, pulse circuits, digital logic circuits. Not for Electronic or Electrical Engineering majors. 3 lectures. Prerequisite: EE 201.

**EL 327 Electronic Instrumentation and Measurement (4)**

Principles and characteristics of instruments and instrumentation systems; analog and digital transducers; A/D conversion; data and signal transmission and amplification problems. Low level signal, high frequency signal, and high accuracy signal measurement problems. Automated instrumentation systems. 3 lectures, 1 laboratory. Prerequisite: EE 301, EL 308.

**EL 328 Discrete Time Systems (3)**

Introduction to the essential theories and techniques of discrete modeling for modern digital processing, applications taken from biological systems, economic systems and digital filtering. 3 lectures. Prerequisite: MATH 317, EE 301.

**EL 334 Electromagnetic Fields I (3)**

Advanced treatment of static vector electric and magnetic fields and their sources. Magnetic fields in ferromagnetic materials. Laplace's equation and boundary value problems. 3 lectures. Prerequisite: MATH 317, EL 207.

**EL 343 Signal Transmission Laboratory (1)**

Impedance measurements, traveling-wave phenomena in transmission lines, impedance matching. 1 laboratory. Concurrent or prerequisite: EL 303.

**EL 347 Digital Integrated Electronics Laboratory (1)**

Experimental investigation of the characteristics of different logic families. 1 laboratory. Prerequisite: EL 219. Concurrent: EL 307.

**EL 348 Electronic Circuits Laboratory (1)**

Design, construction and testing of solid state amplifier to meet stated specifications. 1 laboratory. Concurrent: EL 308.

**EL 349 Integrated Electronic Circuits Laboratory (1)**

Design of electronic subsystems using integrated circuits. 1 laboratory. Concurrent: EL 309.

**EL 361 Electronics Laboratory (1)**

Instrumentation amplifiers, feedback, rectifiers and power control, pulse and digital logic circuits. 1 laboratory. Concurrent or prerequisite: EL 321.

**EL 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**EL 401 Electromagnetic Fields II (3)**

Time changing electric and magnetic fields. Maxwell's equations, with the relationship between field and circuit theory. Plane waves in dielectric and conducting media. Selected topics from wave polarization, reflection and refraction. 3 lectures. Prerequisite: EL 303, EL 334.

**EL 402 Microwave Engineering (3)**

Application of Maxwell's equations and boundary value problems to wave guide structures. Microwave equivalent circuit theorem. Passive microwave devices including treatment of attenuation, insertion loss power division, directional coupling, and the scattering parameters. Introduction to stripline and microstrip techniques. 3 lectures. Prerequisite: EL 401.

**EL 403 Optoelectronic Devices and Systems (3)**

Principles of light. Optical sources, detectors, and displays. Fiber optic waveguides, and an introduction to optical communication systems. 3 lectures. Prerequisite: EL 309, EL 401.

**EL 404 Microprocessor System Design Methodologies (3)**

Classification and functional configurations of existing microprocessors and analysis of hardware system designs and system economics. Interface design techniques utilizing programmable I/O interfaces, real-time clocks, interrupts, and DMA channels. Representative applications. 3 lectures. Prerequisite: EL 319, EL 407, CSC 221, or consent of instructor.

**EL 405 High-frequency Amplifier Design (3)**

Design of modern electronic amplifiers and amplifier systems with advanced techniques. Small signal wideband lowpass amplifier design utilizing both discrete and integrated devices. VHF, UHF amplifier design using S parameters. GaAs FET microwave distributed amplifier. Noise analysis. 3 lectures. Prerequisite: EL 303, EL 309.

**EL 407 Digital Computer Subsystems (3)**

Design of registers, counters, sequencers, accumulators, encoders, decoders, memories, and other computer subsystems. Use of modern techniques and devices in implementation. Consideration given to cost, speed, and dependability. 3 lectures. Prerequisite: EL 319.

**EL 408 Digital Computer Systems (3)**

Design of computer ALU's microprogram controllers, memory systems, and I/O controllers. Use of LSI components in CPU design. Microprogram and nanoprogram development. 3 lectures. Prerequisite: EL 407 or consent of instructor.

**EL 409 Computer Peripheral Interfacing (3)**

Design of the more common computer peripherals (paper devices, floppy disks, etc.) with the emphasis on the controller and interfacing aspects. Use of microprocessors and/or LSI controller chips in the design of intelligent peripherals. 3 lectures. Prerequisite: EL 404.

**EL 411 Network Synthesis and Filter Design Fundamentals (3)**

Modern approach to network synthesis. Network functions. Foster and Cauer canonical synthesis. Transfer functions and transfer function synthesis. Approximation theory. Butterworth and Chebyshev filter design. Introduction to digital filter concepts. 3 lectures. Prerequisite: EE 301.

**EL 412 Advanced Analog Circuits (3)**

Application of linear integrated circuits to data acquisition problems: transducer interfacing, linear and nonlinear preprocessing, phase-locked loops, and high performance quantization and recovery (A/D, D/A conversion). 3 lectures. Prerequisite: EL 309, EL 414.

**EL 413 Analog Integrated Circuits (3)**

Analysis and design of analog integrated circuits. DC and AC designs, feedback techniques, and noise in integrated circuits. Design monolithic operational amplifier with computer simulation programs. 3 lectures. Prerequisite: EL 309.

**EL 414 Introduction to Communication Systems (3)**

Amplitude modulation; frequency and phase modulation; pulse modulation including PAM, PWM, PPM, and PCM; and delta modulation. Noise in communication systems, digital transmission, and introduction to information theory. 3 lectures. Prerequisite: EL 328 and EE 302.

**EL 415 Communication Systems Design (3)**

Design of modern electronic communication and telemetry systems. Emphasis: practical implementation and comparative evaluation of various modulation systems. 3 lectures. Prerequisite: EL 309, EL 414.

**EL 421 Solid-state Microelectronics (3)**

Physical basis of solid-state microelectronics. Passive and active integrated circuit components in Bipolar, MOS, thin and thick film systems. Diffusion, oxidation, ion implantation and other fabrication techniques. Microcircuit layout and design: system development, reliability and economic considerations. Future trends. 3 lectures. Prerequisite: Senior standing.



**EL 423 Microwave Electronics (3)**

Charge and field interactions in oscillators and amplifiers. Transferred electron devices, avalanche transit-time devices, microwave transistors. Circuits associated with oscillators and reflection type amplifiers. 3 lectures. Prerequisite: EL 401.

**EL 424 Antenna Theory and Application (3)**

Linear antenna theory. Antenna as a matching device. Antenna directivity, gain, efficiency, resistance, aperture, and reciprocity. Application of antenna theory to various types of antennas. 3 lectures. Prerequisite: EL 401.

**EL 425 Active Network Synthesis (3)**

Theory and design of active RC networks with filter applications; cascaded and coupled topology of controlled source, state-variable, gyrator, leap frog, and FDNR realizations; introduction to SCF filters; sensitivity analysis; applied synthesis for various classes of filters. 3 lectures. Prerequisite: EL 309.

**EL 430 Computer-Aided Circuit Design (3)**

Analysis and design of active and passive electronic circuits using digital computers. Graphic terminal and time-sharing systems. Survey of available CAD programs and techniques. Applications of ECAP, SPICE and other programs for dc, ac and transient analysis, including tolerance, sensitivity, optimization and device modeling. 3 lectures. Prerequisite: CSC 311, EL 309, or consent of instructor.

**EL 431 Computer-Aided Design of VLSI Devices (3)**

Design of VLSI circuits, design of subsystems, PLA's and finite-state machines, patterning, hand layout, and CIF programming. 3 lectures. Prerequisite: EL 319, EL 309.

**EL 441 Microwave Laboratory (1)**

Experimental investigation of vacuum-tube and solid state microwave sources, crystal and power detectors, coaxial cables, directional couplers and n-port devices. Measurement of SWR by slotted line and reflectometer techniques. Techniques for measurement of attenuation, frequency and power. 1 laboratory. Prerequisite: EL 303, EL 343, EL 401.

**EL 443 Optoelectronics Laboratory (1)**

Experimental investigation of the properties of optical fibers, sources, and detectors. Measurement of fiber physical characteristics, attenuation, losses, and bandwidth. Design of a fiber-optic data link. 1 laboratory. Prerequisite or concurrent: EL 403.

**EL 444 Network Synthesis and Filter Design Lab (1)**

Modern network synthesis; network driving point and transfer function synthesis; design, construction and testing filters of the Butterworth and/or Chebyshev kind—lowpass, bandpass, band elimination and highpass filters. 1 laboratory. Concurrent or prerequisite: EL 411.

**EL 445 Advanced Amplifier Design Laboratory (1)**

Experimental investigation employing advanced techniques. Design of electronic amplifiers and amplifier systems utilizing recently developed components. 1 laboratory. Concurrent or prerequisite: EL 405.

**EL 446 Microprocessor Interfacing Laboratory (1)**

Design and construction of selected digital systems. Utilization of superstrip boards to construct MSI, LSI based logic circuits. Interfacing of student built systems with several representative microprocessors. Hardware/software performance evaluation of microprocessor interfacing techniques. 1 laboratory. Prerequisite or concurrent: EL 309 and consent of instructor.

**EL 447 Digital Subsystems Laboratory (1)**

Laboratory synthesis of combination and sequential logic circuits. Sequential subsystems analysis with the logic state analyzer. Fault testing and automated checkout procedures. Familiarization with the characteristics of SSI and MSI logic components. 1 laboratory. Prerequisite: EL 319, EL 347.

**EL 448 Digital Computer Systems Laboratory (1)**

Laboratory analysis and synthesis of digital computer subsystems. Microprogramming of a simple digital computer via computer simulation. Interfacing with digital systems. 1 laboratory. Prerequisite: EL 407, EL 447.

**EL 451 Solid State and Microelectronic Laboratory (1)**

Laboratory investigation of electronic properties of semiconductor materials. Experimental projects in design, fabrication and evaluation of hybrid/monolithic microelectronic devices and circuits. 1 laboratory. Prerequisite: Senior standing or consent of instructor.

**EL 455 Active Network Synthesis Laboratory (1)**

Advanced laboratory study of sensitivity and stability of active networks prescribed for realization of transfer functions by active network synthesis techniques. Formal experiments and individual project work. 1 laboratory. Concurrent or prerequisite: EL 425.

**EL 456 Communication Systems Laboratory (1)**

Methods of analog and digital modulation and demodulation. Emphasis on spectral analysis, bandwidth requirements and other practical considerations of modulation and demodulation. 1 laboratory. Prerequisite: EL 414.

**EL 461, 462 Senior Project (3) (2)**

Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Miscellaneous course fee required— see *Class Schedule*. Minimum 150 hours total time. Prerequisite: EE 325, EL 309, EL 319, EL 334.

**EL 463 Undergraduate Seminar (2) (CR/NC)**

Discussion of new developments in the fields of communications, computers, and industrial electronics. Fields of employment and job considerations. Credit/No Credit grading. 2 seminars. Prerequisite: Senior standing.

**EL 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**EL 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**EL 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**✓ EL 515 Discrete Time Filters (3) HARRIS**

Digital and switched capacitor filter analysis and design using Z transform techniques. Topics include: frequency domain analysis, approximations to analog filters, and distortion effects. Applications in digital image processing, telecommunications, digital processing of speech and audio/sonar. 3 seminars. Prerequisite: EL 414, graduate standing or consent of instructor.

**EL 517 Information Theory (3)**

Introduction to information transmission theory and coding theory, covering information and entropy, Markov information sources, code properties, coding theorems; Shannon-Fano Codes, linear codes, hamming codes, continuous channels, Gaussian signals and channels. 3 seminars. Prerequisite: EL 414, EE 525, graduate standing or consent of instructor.

**EL 520 Digital Systems Design (3)**

Design of asynchronous sequential machines and pulse mode logic circuits. Selected automata theory topics include state compatibility analysis, state partition analysis, threshold logic, fuzzy logic. Modern digital system design. Analysis of MOS-LSI multiphase logic structures. Comparison of digital subsystems. Microprocessor as a digital subsystem module. 3 seminars. Prerequisite: EL 319, graduate standing or consent of instructor.

**EL 521 Computer Systems (3)**

Organization of digital systems, primarily the modern general purpose, high speed digital computer; arithmetic units, control units, memories, peripheral equipment. Cost and speed trade-offs in the design of such systems. 3 seminars. Prerequisite: EL 407, or consent of instructor.

**EL 522 Microprocessor-Based Digital System Design (4)**

Design and implementation of microprocessor-based digital systems. Their analysis and cost effective use in system design problems. Data acquisition and control systems. Role of microperipheral controllers. Laboratory problems associated with interfacing microprocessors to various systems. 3 seminars, 1 laboratory. Prerequisite: EL 404, or consent of instructor.

**EL 524 Solid State Electronics (3)**

Physical theory of solid-state devices. Properties of metal-semiconductor junctions and p-n junctions. Derivation of properties of diodes, transistors, and four-layer devices from basic physical and mathematical considerations. 3 seminars. Prerequisite: PHYS 412 or equivalent, graduate standing or consent of instructor.

**EL 526 Digital Communications (3)**

Analysis of digital communication techniques including quantization noise, baseband modulation, and transmission modulation. Specific topics include: digitization, PCM, delta modulation, differential PCM, TDM, ASK, PSK, FSK, and bit synchronization. 3 seminars. Prerequisite: EL 414, EE 525, graduate standing or consent of instructor.

**EL 528 Topics in Telecommunication Systems (3-6)**

Topics selected from telephone switching and transmission, data transmission and networking, and microwave relay systems. May be taken for a maximum of 6 units. 3 seminars. Prerequisite: EL 319, EL 401, EL 414 or equivalent, graduate standing or consent of instructor.

**EL 529 Advanced Topics in Microwave Device Electronics (3)**

Emphasis on device and circuit principles of active microwave solid-state devices, their noise aspects and systems applications. 3 seminars. Prerequisite: EL 401, PHYS 412 or equivalent, graduate standing or consent of instructor.

**EL 530 Electro-Optics Systems (3)**

Spatial frequency approach to optics and imaging systems including diffraction theories and resolution, Fourier transforming properties of lenses, spatial filtering, and the optical transfer function. Further topics selected from: holography, optical communications, optical computing and storage, and laser modulation and scanning. 3 lectures. Prerequisite: EL 401, EL 414 or equivalent, graduate standing or consent of instructor.

**EL 570 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors with electrical and electronic engineering background. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ENGL—ENGLISH****ENGL 100 Fundamentals of Writing: English as a Second Language (2) (CR/NC)**

Practice of written patterns of English, developing sentences that express meaning clearly; structured writing assignments; writing following reading and discussion of writing task. Credit/No Credit Grading only. Repeatable. 4 lectures.

**ENGL 101 Fundamentals of Writing: Sentence Construction (4) (CR/NC)**

Practice in writing sentences in a larger context with attention paid to sentence variety, rules of grammar and mechanics. Substantial essay due at the end of the quarter. Directed readings of exemplary essays. Credit/No Credit grading only. Repeatable. 4 lectures.

**ENGL 102 Fundamentals of Writing: Logic and Organization (4) (CR/NC)**

Practice in the strategies of organizing paragraphs in a larger context with attention paid to focus and support. Substantial essay due at the end of the quarter. Directed readings of exemplary essays. Credit/No Credit grading only. Repeatable. 4 lectures.

**ENGL 103 Writing Workshop (4) (CR/NC)**

Individual tutorial help for students writing themes. Discussion of approaches to specific writing assignments. Writing assignments completed primarily in class. Directed reading of exemplary essays. Credit/No Credit grading only. Repeatable. 4 lectures.

**ENGL 106 Controlled Composition (4) (CR/NC)**

For speakers of nonstandard English variations. Instruction aimed at mastering specific conventions of standard English: inflections, article usage, pronoun/antecedent agreement, subject/verb agreement, tense agreement and punctuation. Frequent copying and proofreading assignments requiring transformations of grammatical units. Prepares students for ENGL 107. Credit/No Credit grading only. Repeatable. 4 lectures. Prerequisite: Consent of instructor.

**ENGL 107 Controlled Composition (4) (CR/NC)**

For speakers of nonstandard English variations. Practice in composing and proofreading essays with focus on the specific features of standard English reviewed in ENGL 106. Additional drill and practice in progressive and perfect tenses, present and past participles, and negating and contradicting. Credit/No Credit grading only. Repeatable. 4 lectures. Prerequisite: ENGL 106 or consent of instructor.

**ENGL 108 Fundamentals of Standard English: Spelling and Vocabulary (4) (CR/NC)**

For speakers of non-standard English variations who need additional work with the conventions of standard English. Programmed instruction in vocabulary development with additional drill and practice in the English sound system as it relates to spelling. Credit/No Credit grading. Repeatable. 4 lectures. Prerequisite: Consent of instructor.

**ENGL 110 Intensive English for Nonnative Speakers (4) (CR/NC)**

Practice in oral and written communication, pronunciation, sentence structure, reading, and composition. Prepares students for ENGL 114. Credit /No Credit grading only. 4 lectures.

**ENGL 111 English Sentence Structure for ESL/EFL Students (4) (CR/NC)**

Focus on the fundamentals of sentence patterns, sentence construction, and sentence combining within the context of the paragraph and story. Practice in writing a variety of effective sentences; practice in linking sentences in a unified paragraph controlled by a topic sentence. Credit/No Credit grading only. 4 lectures. Prerequisite: Non-native English speakers who need to develop skill in writing English sentences.

**ENGL 112 English Paragraph Development for ESL/EFL Students (4) (CR/NC)**

Focus on the fundamentals of paragraph development within the context of the essay and story. Writing paragraphs with strong topic sentences that control paragraph unity; linking paragraphs for a unified essay through transitions and the control of the thesis statement. Credit/No Credit grading only. 4 lectures. Prerequisite: ENGL 111 or consent of instructor.

**ENGL 114 Writing: Exposition (4)****GEB A.1.**

Writing and stylistic analysis of expository papers. Study and application of techniques of exposition. Critical reading of model essays. 4 lectures.

**ENGL 125 Critical Thinking (3) (Also listed as PHIL 125 and SPC 125)****GEB A.2.**

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the composing of arguments in English. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 215 Writing: Argumentation (4)****GEB A.4.**

Writing and critical evaluation of argumentative papers. Techniques of research and evaluation of research sources. Discussion of elements of argumentation, inductive and deductive reasoning and use of supporting documentation in written discourse. Examination of special problems in invention, form, style and evaluation. Not open to students with credit in ENGL 218. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

**ENGL 218 Writing: Argumentation and Reports (4)****GEB A.4.**

Argumentation in writing. Composing and conveying technical information. Methods of research. Analysis of writing situations. Analysis and criticism of student reports and technical reports. Extensive writing practice in professional formats: reports, proposals, letters, memoranda. Not open to students with credit in ENGL 215. 4 lectures. Prerequisite: ENGL 114 and ENGL 125 or PHIL 125 or SPC 125.

**ENGL 230 Masterworks of British Literature: Through the Eighteenth Century (4) GEB C.1.**

Selected readings in British literature from its beginnings through the Eighteenth Century. Early and middle English works read in translation. Includes works by such authors as Chaucer, Shakespeare, Milton, Swift, Pope and Johnson. 4 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 231 Masterworks of British Literature: Romantic Period to the Present (4) GEB C.1.**

Selected readings in British literature from the Romantic period to the present. Includes works by such Romantic, Victorian, Edwardian and Twentieth Century writers as Wordsworth, Byron, Tennyson, Shaw, Yeats and Eliot. 4 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 240 American Tradition in Literature (4)****GEB C.1.**

Selected readings from major authors that show the American literary tradition from the Colonial period into the Twentieth Century. Literary expression of movements that shaped the American character, including Puritanism, Deism, Transcendentalism and Naturalism. Includes works by such authors as Franklin, Emerson, Poe, Whitman, Dickinson, Twain, Frost, Hemingway and Faulkner. 4 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 251 Great Books of World Literature: Classical and Ancient World (3) GEB C.1.**

Selected readings from world writings, beginning with the earliest epics through the literature of Greece and Rome. Includes such authors as Homer, Aeschylus, Sophocles, Euripedes, Plato and Ovid. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 252 Great Books of World Literature: Middle Ages, Renaissance and Enlightenment (3)****GEB C.1.**

Selected masterpieces from the fall of the Roman Empire up to the Eighteenth Century. Includes such authors as Dante, Cervantes, Shakespeare, Moliere, Voltaire and Swift. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 253 Great Books of World Literature: Romanticism and the Modern World (3) GEB C.1.**

Selected works from the beginning of Romanticism up to the present. Includes material from literary movements such as Realism, Naturalism, Symbolism and Existentialism, with works by such authors as Goethe, Hugo, Keats, Wordsworth, Flaubert, Balzac, Dostoevsky, Woolf, Joyce and Beckett. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 255 The Bible as Literature (3)**

Old and New Testaments with historical background. Literary forms and characteristics of Hebraic writing. Appreciation of the far-reaching use of Biblical narrative and reference in literature, speeches, art, drama, and modern film. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 260 Children's Literature (3)**

Analysis and evaluation of realism, traditional fantasy, modern fantasy, and poetry for children in multiple subject classroom grades K-8. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 290 Introduction to Linguistics (4)**

Overview of linguistics from its origin to present forms and practices. 4 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 302 Writing: Advanced Composition (4)**

Writing and analysis of expository and argumentative papers at an advanced level. Discussion and application of rhetorical, stylistic and grammatical principles through writing and critical reading of essays. Practice in revising and editing papers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 310 Corporate Communication (4)**

Instruction and practice in forms of communication characteristic of business and industry. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 311 Advanced Technical Writing (4)**

Technical writing as produced in industry and government. Analytic reports, manuals, instructions, specifications. Trade journal articles. Editing skills. Orientation to technical communication careers. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 318 Writing for Scientific Journals (4)**

Practice of the skills necessary in the preparation of articles for scientific journals. Extensive writing and copy-editing, and study of the forms and styles required by the professional societies in each field. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 325 Creative Writing (4)**

Instruction and practice in the writing, revising, and evaluating of fiction, poetry, or drama. Repeatable to 8 units. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 326 Literary Criticism (4)**

Instruction and practice in writing, revising, and evaluating various kinds of critical writing. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 330 British Literature: Medieval Period (4)****GEB C.3.**

Major works of the Old and Middle English periods in modern translation, including epic and lyric poetry, early religious writings, romance cycles and mystery and morality plays. Representative works include Beowulf, the Arthurian legends, Everyman and Chaucer's Canterbury Tales. 4 lectures. Prerequisite: One literature course.

**ENGL 331 British Literature: The Renaissance (4)****GEB C.3.**

Major works of Elizabethan and Jacobean prose, poetry and drama. Literary responses to the foundations of humanism, individualism, nationalism and other forces of change leading from the medieval to the modern world. Representative writers include Spenser, Sidney, Donne, Jonson, Bacon and Milton. 4 lectures. Prerequisite: One literature course.

**ENGL 332 British Literature: The Enlightenment (4)****GEB C.3.**

Major prose, poetry, and drama from 1660 to 1800, emphasizing the period's interest in order, reason, rules and decorum in both life and literature. Representative writers include Dryden, Swift, Pope, Johnson, Boswell and Defoe. 4 lectures. Prerequisite: One literature course.

**ENGL 333 British Literature: Romanticism (4)****GEB C.3.**

Major works of the Romantic period. Romantic concepts of imagination, individualism, nature and the organic qualities of art. Representative writers include Blake, Wordsworth, Coleridge, Byron, Shelley and Keats. 4 lectures. Prerequisite: One literature course.

**ENGL 334 British Literature: The Victorians (4)****GEB C.3.**

Major prose and poetry of the Nineteenth Century. Victorian concerns such as progress, belief, alienation and threats to the sense of personal identity in a technological age. Representative writers include Carlyle, Ruskin, Tennyson, Browning and Arnold. 4 lectures. Prerequisite: One literature course.

**ENGL 339 Introduction to Shakespeare (3)****GEB C.3.**

Readings from such works as Hamlet, King Lear, A Midsummer-Night's Dream and the sonnets. 3 lectures. Prerequisite: One literature course.

**ENGL 340 American Literature to 1860 (4)****GEB C.3.**

Selected prose and poetry by American writers to 1860, showing the Colonial foundation of our national literature, developments of the Enlightenment and achievements of the Romantic age. Representative writers include Bradstreet, Edwards, Franklin, Paine, Emerson, Poe, Hawthorne, Thoreau and Melville. 4 lectures. Prerequisite: One literature course.

**ENGL 341 American Literature: 1860–1914 (4)****GEB C.3.**

Selected prose and poetry by American writers from the Civil War to World War I with the focus on local-color fiction and on literary Realism and Naturalism. Representative writers include Whitman, Dickinson, Twain, James, Howell, Chopin and Crane. 4 lectures. Prerequisite: One literature course.

**ENGL 342 American Literature: 1914 to the Present (4)****GEB C.3.**

Selected prose, poetry and drama by American writers from World War I to the present, depicting the social and psychological complexities of the Twentieth Century. Representative authors include Frost, Eliot, Stevens, Fitzgerald, Hemingway, Faulkner and O'Neill. 4 lectures. Prerequisite: One literature course.

**ENGL 350 Modern Novel (3)****GEB C.3.**

Readings in representative Twentieth Century novels with special emphasis on form and ideas. 3 lectures. Prerequisite: One literature course.

**ENGL 351 Modern Poetry (3)****GEB C.3.**

Readings in representative Twentieth Century poetry with special emphasis on form and ideas. 3 lectures. Prerequisite: One literature course.

**ENGL 352 Modern Drama (3)****GEB C.3.**

Readings in representative Twentieth Century drama with special emphasis on form and ideas. 3 lectures. Prerequisite: One literature course.

**ENGL 360 Literature for Adolescents (3)**

Readings in literature suitable for use in secondary schools. 3 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 362 Myth and Symbol in Literature for Youth (4)**

Selected readings to explore the cultural archetypes and patterns of popular children's and young people's stories of the past and present. 4 lectures. Prerequisite: ENGL 260 or ENGL 360, or a 300-level literature course, or consent of instructor.

**ENGL 370 World Cinema (4)****GEB C.3.**

Major works of international cinema with emphasis on critical interpretation, on the ways film communicates visually and verbally, and on the historical and cultural contexts in which films are created. Contains films by directors such as Howard Hawks, Orson Welles, Ingmar Bergman and Akira Kurosawa. 3 lectures, 1 activity. Prerequisite: One literature course.

**ENGL 380 Contemporary Literary Ideas (3–4)****GEB C.3.**

Literature or cinema of the modern period. Significant writers and filmmakers, both from the Western world and the non-Western world, and their literary and technical achievements. Demonstrates relationships of prevailing Twentieth Century modes of thought. Repeatable to 9 units under different subtitles. 3 or 4 lectures. Prerequisite: One literature course.

**ENGL 390 Modern English Grammar (4)**

Linguistic analysis of the English language. Phonology, morphology, and syntax. Traditional, descriptive-structural, and transformational-generative grammars. 4 lectures. Prerequisite: ENGL 114 or equivalent.

**ENGL 392 Contemporary Grammar and Composition (4)**

Instruction and practice in writing and revising essays. Emphasis on rhetorical principles for clear composition, using the English language and grammar systems as subjects. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 395 History of the English Language (4)**

Development of the English language from its origins to its present forms and practices. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 400 Special Problems for Advanced Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ENGL 415 Advanced Creative Writing (4)**

Instruction and practice in advanced writing, revising and evaluating of fiction or poetry. 4 lectures. Prerequisite: ENGL 325 or permission of instructor. Repeatable to 8 units.

**ENGL 421 Writing in Secondary Schools (4)**

Approaches to writing in secondary schools. Overview of composition theory and examination of current research on the teaching of writing. Exploration of classroom techniques appropriate to student needs and program goals. 4 lectures. Prerequisite: ENGL 215 or ENGL 218.

**ENGL 424 Organizing and Teaching English (4)**

Introduction to the organization, selection, presentation, application, and interpretation of subject matter in English in secondary schools. 4 lectures. Prerequisite: Admission to teacher education program or valid teaching credential.

**ENGL 430 Chaucer (4)**

Selected readings from *Canterbury Tales* and Chaucer's other major poems. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

**ENGL 431 Shakespeare (4)**

Representative comedies, tragedies, and histories. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

**ENGL 432 Milton (4)**

*Paradise Lost*, *Paradise Regained*, and *Samson Agonistes*, with some attention to the minor poems. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

**ENGL 439 Significant British Writers (4)**

Selected British writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 seminars. Prerequisite: ENGL 330, or ENGL 331, or ENGL 332, or ENGL 333, or ENGL 334.

**ENGL 449 Significant American Writers (4)**

Selected American writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 seminars. Prerequisite: ENGL 340, or ENGL 341, or ENGL 342.

**ENGL 459 Significant World Writers (4)**

Selected world writers, as individual writers or in groups. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 seminars. Prerequisite: 8 units of literature or consent of instructor.

**ENGL 461 Senior Project (2)**

Selection and completion of a project under faculty supervision. Projects typify problems which a graduate may face in his field of employment. Project results are presented in a formal written report. Minimum of 60 hours total time. Prerequisite: Prior consent of instructor.

**ENGL 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ENGL 495 Applied Language Study (4)**

Linguistic theory applied to human communications, human relations, and literature. Each course will have a subtitle descriptive of the content. May be repeated to 8 units. 4 seminars. Prerequisite: ENGL 390 or consent of instructor.

**ENGL 496 Introduction to Teaching English as a Second Language/Dialect (4)**

Language analysis and assessment; methods and materials for testing and teaching nonnative English speakers; phonemic analysis, oral-aural testing; oral-aural practice; vocabulary acquisition; oral and written patterns of organization, structure, grammar; acquiring English for special purposes; evaluating curriculum materials; observing and tutoring ESL students. 4 seminars. Prerequisite: 8 units of linguistics or consent of instructor.



**ENGL 502 Seminar in Critical Analysis (4)**

Basic approaches used by critics. Multiple points of view; application to literary works; reflection of critical analysis in student compositions. Designed to aid the teacher of secondary English to enrich the courses taught in secondary schools. 4 seminars. Prerequisite: Graduate standing.

**ENGL 503 Seminar in English Linguistics (4)**

Review of current modes of linguistic study and introduction to linguistic research and its application. 4 seminars. Prerequisite: ENGL 290, ENGL 390 or consent of instructor.

**ENGL 504 Seminar in Applied English Linguistics (4)**

Development of English; consideration of problems of grammar and uses of language. May be repeated to 12 units. 4 seminars. Prerequisite: ENGL 503.

**ENGL 505 Seminar in Composition Theory (4)**

Special problems in composition. Direct application of new language information to composition or detailed analysis of relationship between rhetorical principles and writing. May be repeated to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 506 Pedagogical Approaches to Composition (4)**

Practical problems in the teaching of English composition. Application and study of practical approaches. Discussion of day to day experiences in the classroom. Discussion of and research into the nature and solution of student writing problems. Required of all new teaching assistants in English. Repeatable to 8 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 511 Seminar in American Literature (4)**

American authors and periods. Written and oral reports of individual investigation. May be repeated to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 512 Seminar in British Literature (4)**

British authors or periods. Written and oral reports of individual investigation. May be repeated to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 513 Seminar in Special Topics (4)**

Themes and ideas in language and literature not ordinarily covered in the routine graduate course offerings. Repeatable to 8 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGL 520 Problems in Secondary English (3)**

Topical issues in teaching secondary school English. Designed especially for credentialed teachers in the field. Alternate topics like the following: writing instruction workshop, teaching masterworks and young adult literature, implications of rhetorical and discourse theories, computer technology in English, literary criticism and teaching, research in reading and writing. Written reports of topic investigations. May be repeated to 9 units. 3 seminars. Prerequisite: Graduate standing in English.

**ENGL 590 Directed Study (4)**

Independent or group study of special problems in selected areas of language, composition, or literature. May be repeated to 12 units. 4 seminars. Prerequisite: Graduate standing in English.

**ENGR—ENGINEERING****ENGR 251 Digital Computer Applications (2)****GEB F.1.**

Programming techniques and procedures with applications to several selected engineering problems from a variety of course situations. Actual problem solutions by means of a digital computer will be required. 2 activities. Prerequisite: MATH 142 or MATH 132, PHYS 131 or PHYS 121.

**ENGR 301 Technology in the 20th Century (3)****GEB F.2.**

Role of science, engineering and technology in the Twentieth Century. Effects of technological change, the function of the scientist-engineer in society. Computer as a tool, case studies of systems to compare alternative approaches to problem solving. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**ENGR 563 Graduate Seminar (1)**

Current developments in the field of engineering. Participation by students, faculty and guest lecturers. 1 seminar. Total credit limited to 3 units. Prerequisite: Graduate standing.

**ENGR 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will select, with faculty guidance and approval, a topic for independent research or investigation resulting in a thesis or project to be used to satisfy the degree requirement. An appropriate experimental or analytical thesis or project may be accepted. Prerequisite: Graduate standing.

**ENT—ENTOMOLOGY****ENT 220 Agricultural Entomology (4)**

Major insect orders and families of agricultural importance. Taxonomy, identification, life cycles, and histories and controls of insects. 2 lectures, 2 laboratories.

**ENT 326 General Entomology (4)**

Introduction to the study of insects. Structure, major orders and families of insects, life histories, economic importance and control. Insect collection required. 3 lectures, 1 laboratory.

**ENT 332 Economic Entomology (4)**

Identification, life histories and control of insects beneficial or injurious to various crops, fruits, stored products, domestic animals and man; important invertebrates such as mites, ticks and spiders. 3 lectures, 1 laboratory. Prerequisite: ZOO 132 or BOT 122; ENT 326; CHEM 326 or consent of instructor.

**ENT 421 Immature Stages of Insects (4)**

Identification, biology, and economic importance of preimaginal insect forms. 2 lectures, 2 laboratories. Prerequisite: ENT 326, BIO 325.

**ENVE—ENVIRONMENTAL ENGINEERING****ENVE 200 Special Problems for Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ENVE 304 Thermodynamics of Processes (3)**

Material balances, energy balances, liquids and mixtures, vapor-liquid equilibria, solubility and absorption, equilibrium in chemical reactions. 3 lectures. Prerequisite: ME 302; CHEM 129 or consent of instructor.

**ENVE 309 Noise and Vibration Control (3)**

Behavior of sound waves, selection of instrumentation, practical measurements, criteria for noise and vibration control. Assessment of noise produced by transportation and other engineering facilities. 3 lectures. Prerequisite: PHYS 133, MATH 241.

**ENVE 316 Automatic Process Control (2)**

Introduction to automatic control instrumentation. Methods of analysis of control systems. Analytical determination of control response. 2 lectures. Prerequisite: MATH 242, ME 302, ME 313.

**ENVE 324 Introduction to Air Pollution (3)****GEB F.2.**

Causes and effects of air pollution on the individual, the community and industry. Legal and economic aspects. For nonmajors. 3 lectures. Prerequisite: Junior standing.

**ENVE 325 Environmental Air Quality (3)**

Consideration of ambient air contamination inside and outside. Factors included in establishing, monitoring and maintaining air quality standards. 3 lectures. Prerequisite: CHEM 125. Concurrent: ME 302.

**ENVE 326 Air Pollution Measurements (3)**

Planning and conducting of atmospheric surveys. Collection, evaluation, and interpretation of data as they pertain to the concentration of pollutants sampled. 2 lectures, 1 laboratory. Prerequisite: CHEM 129, ENVE 325.

**ENVE 330 Environmental Quality Control (3)****GEB F.2.**

Application of scientific and engineering principles to control the development and use of air, water and land resources. Control of pollution of the environment. Disposal of wastes. Administrative and legal aspects. For nonengineering majors. 3 lectures. Prerequisite: Junior standing.

**ENVE 331 Introduction to Environmental Engineering (3)**

Application of scientific, engineering, and economic principles to development and control of environmental problems. Air pollution control. Water and wastewater treatment. Hazardous wastes. Resource recovery. Noise control. Legal and administrative aspects. 3 lectures. Prerequisite: Junior standing in School of Engineering and Technology.

**ENVE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**ENVE 411 Air Pollution Control (3)**

Theory, principles and practices related to the control of particulate emissions. Mechanical separations. Cost and design of control systems. 3 lectures. Prerequisite: ENVE 326.

**ENVE 421 Mass Transfer Operations (3)**

Theory, principles and practices related to the control of gaseous emissions. Process characteristics. Odor control. Mass transfer operations as applied to environmental control. 3 lectures. Prerequisite: ENVE 325.

**ENVE 434 Water Quality Measurements (2)**

Methods employed in the qualitative and quantitative determinations of water and waste water constituents. Physical, chemical and biological procedures used in determining water quality. Testing of effluents from industrial and municipal treatment plants. 1 lecture, 1 laboratory. Prerequisite: CHEM 129, CHEM 326.

**ENVE 436 Introduction to Hazardous Waste Management (3)**

Overview of industrial processes which produce hazardous wastes. Principles of toxicology and review of state and federal regulations for hazardous wastes, including RCRA, TSCA, and superfund laws. Storage, handling, and transport of hazardous wastes. Unit operations and processes treatment and reduction. Ultimate disposal including incineration and secure landfills. 3 lectures. Prerequisite: CE 440 or equivalent or consent of instructor.

**ENVE 438 Water and Waste Water Treatment (3)**

Application of the physical operation, and chemical and biological unit processes principles to the analysis and design of potable water and waste water treatment facilities. Advanced waste water treatment technology. Water and waste water sludge treatment. 3 lectures.

**ENVE 439 Solid Waste Management (3)**

Chemical and physical properties of municipal and industrial refuse. Landfill disposal, incineration, composting. Industrial and commercial solid waste disposal problems and treatment methods. Pyrolysis. Salvage and recycle operations. Economics of disposal methods. Interrelationship between water quality and landfill operations. 2 lectures, 1 laboratory. Prerequisite: CE 440 or equivalent or consent of instructor.

**ENVE 441, 442 Advanced System Design (3) (3)**

Individual and team project work in designing systems for industrial ventilation, air and water pollution control, solid waste disposal and heating, ventilating and air conditioning. 1 lecture, 2 laboratories. Prerequisite: ME 313, ME 341.

**ENVE 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time.

**ENVE 465 Environmental Management and Urban Systems (2)**

Interdisciplinary study of urban pollution sources and control. Political, economic, and technological interrelationships. Participation in METRO-APEX, assuming roles of several urban decision makers. 1 lecture, 1 activity. Prerequisite: Consent of instructor.

**ENVE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ENVE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**ENVE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

**ENVE 534 Advanced Design of Pollution Control Systems (3)**

Comprehensive problems in pollution control. Methods of analysis, design of unit operations and processes for environmental engineering facilities. 1 seminar, 2 laboratories. Prerequisite: Graduate standing and ENVE 325.

**ENVE 535 Advanced Wastewater Treatment (3)**

Operations and processes used in tertiary treatment. Chemical coagulation, flocculation, sedimentation, filtration, absorption. Methods for removal of phosphorous, nitrogen, solids and organics. Integration of advanced wastewater treatment processes. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ENVE 536 Biological Wastewater Treatment Processes Engineering (3)**

Fundamentals of reactor engineering. Biochemical and microbiological background. Modeling and design of biochemical reactors. 3 lectures. Prerequisite: ENVE 439, CE 440, graduate standing or consent of instructor.

**ENVE 541 Resource and Energy Recovery from Waste (3)**

In-depth evaluation of physical and biological processes for the recovery of resources and energy from solid waste. Processes to be studied: mechanical sorting, recycling, combustion, gasification, and anaerobic digestion. 3 lectures. Prerequisite: ENVE 325 (recommended), ENVE 439, CE 440 or equivalent, graduate standing or consent of instructor.

**ENVE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

**ET—ENGINEERING TECHNOLOGY****ET 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ET 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation of techniques, studies or laboratory application of selected problems. Total credit limited to 4 units, with maximum of 2 units per quarter. Prerequisite: Consent of department head.

**ET 441 Technical Supervision in Industry (1)**

Principles and practices of supervising technical employees. Application of fundamental concepts and techniques of supervision provided by assignment in manufacturing laboratories. 1 laboratory. Prerequisite: Junior standing.

**ET 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their fields of employment. Project results are presented in a formal report. Miscellaneous course fee required—see *Class Schedule*. Minimum 150 hours total time. Prerequisite: Senior standing.

**ET 463 Undergraduate Seminar (2)**

Special studies and technical developments in the field. Individual reports on important technology in the engineering technology field. 2 seminars. Prerequisite: SPC 202 and senior standing.

**ET 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ET 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**ETAC—ENGINEERING TECHNOLOGY—AIR CONDITIONING****ETAC 121 Air Conditioning and Refrigeration Principles (4)**

Principles of commercial and industrial air conditioning and refrigeration systems. Installation, service maintenance, and cost estimating. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

**ETAC 123 Environmental Graphics and System Design (3)**

System design and layout of environmental control systems including piping and air distribution concepts. 1 lecture, 2 laboratories.

**ETAC 201 Air Conditioning and Refrigeration Codes (4)**

Introduction to current federal, state, and local codes for equipment, sanitation, water and fuel supplies, fire protection and human safety as applied to building plumbing, heating, ventilating, refrigeration, and air conditioning systems. 3 lectures, 1 laboratory.

**ETAC 221 Mechanical Equipment of Buildings (3)**

Application of engineering analysis comfort control. Design includes forced air circulation systems, sanitary plumbing, water supply and energy sources. Applicable building code requirements which influence system design. 2 lectures, 1 laboratory. Prerequisite: PHYS 123.

**ETAC 301 Computer Aided HVAC (3)**

Programming techniques, estimating and design problems peculiar to Heating, Ventilating and Air Conditioning industry. 1 lecture, 2 laboratories. Prerequisite: Junior standing or consent of instructor.

**ETAC 321 Air Distribution Systems (3)**

Materials and techniques in fabrication and installation of air ducts for heating, ventilating, refrigerating, and air conditioning. Introduction to fabrication of air handling equipment and related accessories for high and low velocity systems. 1 lecture, 2 laboratories. Prerequisite: ETAC 123, ETMP 246.

**ETAC 331, 332 Refrigeration Systems (4) (4)**

Operation, installation, and supervision of medium and low temperature refrigeration systems for food and product processing and storage using various staging systems. Cold storage and building requirements for efficient operation. Low temperature testing and cryogenic refrigeration. Transport refrigeration system. 3 lectures, 1 laboratory. Prerequisite: ETAC 121.

**ETAC 339 Heat Exchanger Technology (3)**

Heat exchanger applications for the heating, ventilating, air conditioning and refrigeration industries. 2 lectures, 1 laboratory. Prerequisite: PHYS 122, ETAC 331.

**ETAC 425, 426 Air Conditioning Systems (4) (4)**

Application of complete air conditioning consisting of heating, ventilating, humidification, dehumidification, refrigeration, air pollution, water treatment and control equipment for commercial and industrial applications. 3 lectures, 1 laboratory. Prerequisite: ETAC 332.

**ETAC 439 Instruments and Controls (3)**

Application of instrumentation and automatic controls to heating, ventilating, and air conditioning systems. 2 lectures, 1 laboratory. Prerequisite: ETEL 126.

**ETAC 445 HVAC Controls Technology (3)**

Electrical, electronic, and pneumatic systems used to control heating, ventilating, and air conditioning installations. 2 lectures, 1 laboratory. Prerequisite: ETAC 439 or consent of instructor.

**ETEL—ENGINEERING TECHNOLOGY-ELECTRONIC****ETEL 124 Introduction to Electronic Circuits (4)**

Application of DC and AC circuit concepts to the solution of electronic circuit problems. 3 lectures, 1 laboratory.

**ETEL 125 Introduction to Electronic Devices (4)**

Application of AC/DC theory to the understanding of basic electronic devices. 3 lectures, 1 laboratory. Prerequisite: ETEL 124.

**ETEL 126 Electrical Practices (4)**

Fundamentals of industrial power distribution systems. Introduction to theory and practice of poly-phase circuits and motors. Electrical safety, industrial wiring practices, and practical trouble shooting. 3 lectures, 1 laboratory. Prerequisite: ETEL 124.

**ETEL 218 Digital Circuits I (3)**

Mathematical and logic foundations of digital systems. Topics include: number systems, Boolean Algebra, logic symbology, implementation of combinational networks, flip-flops, registers. 3 lectures. Prerequisite: MATH 120. Prerequisite or concurrent: ETEL 125.

**ETEL 230 Electric Machine Technology (3)**

DC and AC motors and generators, their construction selection and application, and the use of electric and electronic control of these devices. 2 lectures, 1 laboratory. Prerequisite: ETEL 126.

**ETEL 231 Passive Network Analysis (4)**

Application of Thevenin and Norton theorems to steady state AC networks. Complex number in circuit analysis. AC passive circuit transfer functions with gain-phase versus frequency analysis (Bode Plots). Series-parallel equivalent circuits of RLC circuits and transformers. RC and RL transients analysis. 3 lectures, 1 laboratory. Prerequisite: ETEL 125, MATH 131, CSC 101, or consent of instructor.

**ETEL 232 Electronic Circuits and Devices I (4)**

Semiconductor devices and circuits. H-parameters and load line techniques in analyzing amplifiers. Computation of current, voltage, and power gains, input and output impedances. Bias stability and leakage current considerations. 3 lectures, 1 laboratory. Prerequisite: ETEL 231.

**ETEL 233 Electronic Circuits and Devices II (4)**

Active discrete and integrated devices. Use of device parameters and specifications to analyze simple linear circuits. Use of pulse and timing circuits, power amplifier circuits, and active regulated DC power supplies. 3 lectures, 1 laboratory. Prerequisite: ETEL 232.

**ETEL 311 Transmission Lines and Antennas (4)**

Application of transmission lines and antennas. Smith charts and the propagation of the radio signal from various antennas. 3 lectures, 1 laboratory. Prerequisite: ETEL 231, MATH 132 concurrently.

**ETEL 312 Active Linear Circuits (4)**

Analysis and design of multistage transistor amplifier with emphasis on the operational amplifier and its applications. Low-frequency and high-frequency limitations, Miller effect, pulse testing, Bode Plots, Nyquist stability criteria. Barkhausen criteria for oscillation. Power amplifiers, heat sinks, integrated circuit voltage regulators. 3 lectures, 1 laboratory. Prerequisite: ETEL 233, MATH 133.

**ETEL 334 Digital Circuits II (4)**

Analysis of electronic digital circuits. Topics include: Bipolar and MOS logic gates, loading and interfacing, counters, adders, memories, encoders, decoders, digital displays, A/D and D/A converters. 3 lectures, 1 laboratory. Prerequisite: ETEL 218, ETEL 233.

**ETEL 335 Communications I (4)**

Communication signal spectrum investigation including time domain to frequency domain conversions using Fourier analysis. Evaluation of various modulation techniques including amplitude, angle, and pulse forms. Noise, its use and effects in communications, and various forms of solid state RF amplifiers. 3 lectures, 1 laboratory. Prerequisite: ETEL 311, ETEL 312.

**ETEL 338 Introduction to Computer Technology (4)**

Selected computer components, circuits and systems and their influence on programming in machine language. Problem solving using a digital computer. 3 lectures, 1 laboratory. Prerequisite: ENGR 251, ETEL 334.

**ETEL 432 Automatic Control (4)**

Electronic and electromechanical systems used in servomechanisms. Stability criteria. Nichols Chart utilization. Compensation networks and control system testing. 3 lectures, 1 laboratory. Prerequisite: ETEL 312.

**ETEL 435 Communications II (4)**

Analysis of communication systems. Receivers, transmitters, analog and digital techniques. Equipment specifications, measurement techniques, application of Modems. 3 lectures, 1 laboratory. Prerequisite: ETEL 335.

**ETEL 438 Computer Technology I (4)**

Analysis of computer circuits and components in a specific digital computer. Effects of computer architecture on machine and assembly language programming. Use of hardware and software aids for troubleshooting and development. 3 lectures, 1 laboratory. Prerequisite: ETEL 338.

**ETEL 441 Video Technology (4)**

Introduction to colorimetry principles. Review of television system synchronization and compatibility requirements. Analysis of the operation of circuits in a solid state television. Circuit responses observed in laboratory. Field trip to a major network television facility. 3 lectures, 1 laboratory. Prerequisite or concurrent: ETEL 335.

**ETEL 449 Computer Technology II (4)**

Computer controlled testing and instrumentation using a particular computer and the associated operating system. Analysis of peripheral devices and techniques for interfacing. Locating system malfunctions using lab equipment, maintenance manuals, and diagnostic programs. 3 lectures, 1 laboratory. Prerequisite: ETEL 338.

**ETEL 452 Filter Networks (4)**

Theory and application of filter networks. Butterworth and Chebyshev passive filters and use of IC operational amplifiers in active filters. Special filters such as ceramic, crystal, mechanical, SAW and digital. 3 lectures, 1 laboratory. Prerequisite: ETEL 312.

**ETEL 455 Electro-Optics Technology (4)**

Fundamentals of electro-optics devices and circuits. Parameters, units, sources and systems found in electro-optics. Solving problems encountered in electronics and optics. Laboratory study of devices, circuits and systems. 3 lectures, 1 laboratory. Prerequisite: ETEL 335.

## ETHS—ETHNIC STUDIES

### ETHS 114 Racism in American Culture (3)

Survey and analysis of racism in the development of American institutions and its effect upon minority ethnic groups and society. 3 lectures.

### ETHS 210 Cultural Heritage (3)

History and culture of selected minority groups, their role in and contributions to the American cultural heritage. 3 lectures.

## ETME—ENGINEERING TECHNOLOGY—MECHANICAL

### ETME 131 Introduction to Engineering Drawing (2)

Basic instruction in drafting methods, techniques and use of equipment. Geometric constructions. Principles and practices of isometric, oblique, and multiview drawing systems. 1 lecture, 1 laboratory.

### ETME 141 Applied Descriptive Geometry (2)

Computer aided graphical solutions of problems involving points, lines and planes in three-dimensional space by method of multiview projection. Intersections and development of geometric solids. Application to engineering design. 1 lecture, 1 laboratory. Prerequisite: High school drafting or ETME 131.

### ETME 142 Engineering Drawing I (1)

Advanced principles and methods of multiview and pictorial drawing. Conventional industrial drafting practices including sectioning and dimensioning techniques. Auxiliary views. Threads and fasteners. Dimensioning and tolerancing. Surface finishes. Drawing reproduction processes. 1 laboratory. Prerequisite: ETME 131 or recent high school drafting.

### ETME 143 Engineering Drawing II (1)

Working drawings of mechanical components including details and assemblies. Selection of views, scales, dimensions, symbols and notes. Title blocks. Engineering change systems. Offline and on-terminal experiences in computer aided drafting procedures utilizing the CRT, alphanumeric keyboard, and function keyboard; logon, retrieval and file subroutines. 1 laboratory. Prerequisite: ETME 142.

### ETME 205 Statics for Engineering Technology (3)

Statics by scalar methods. Includes forces, couples, resultants, equilibrium, trusses, cables, friction, centroids, and moments of inertia. 3 lectures. Prerequisite: MATH 131, PHYS 121.

### ETME 206 Dynamics for Engineering Technology (4)

Dynamics by scalar methods. Includes kinematics (both absolute and relative motion of particles and bodies) and kinetics, force, mass, acceleration, work and energy, impulse and momentum, and fundamentals of vibrations. 4 lectures. Prerequisite: ETME 205.

### ETME 240 CAD Project Laboratory (1) (CR/NC)

Computer aided design methods and applications utilizing a CAD system on individual or group investigation of selected projects. Total credit limited to 4 units, not more than 1 unit per quarter. Credit/No Credit grading only. 1 laboratory. Prerequisite: ETME 143 or consent of instructor.

### ETME 301 Thermodynamics for Engineering Technology (4)

Fundamental concepts of work, heat, and energy. First and second laws of thermodynamics. Properties of ideal gases and vapors. Combustion, vapor and gas power cycles. Introduction to heat transfer fundamentals. 4 lectures. Prerequisite: PHYS 122, CHEM 121, MATH 132.

### ETME 311 Fluid Mechanics for Engineering Technology (3)

Principles that underlie the flow of various fluids. Fluid statics, kinematics of fluid flow, viscosity and fluid friction. Incompressible flow in pipes and open channels, flow measurement, fluid machinery and lubrication. 3 lectures. Prerequisite: PHYS 122, ETME 206.



**ETME 320 Mechanisms (3)**

Motion of machine parts. Graphical methods for determining displacements, velocities, and accelerations in linkages, cams, gears, and other mechanical assemblies. 1 lecture, 2 laboratories. Prerequisite: ETME 142, ETME 206.

**ETME 333 Industrial Hydraulics and Pneumatics (4)**

Basic principles of hydraulics and pneumatics. Characteristics and performance of various hydraulic and pneumatic components such as pumps, compressors, cylinders, motors, valves, accumulators, lines, fittings, filters, etc. Hydraulic fluids. Component selection and circuit layout using U.S. standard graphic symbols. 3 lectures, 1 laboratory. Prerequisite: ETME 311 or consent of instructor.

**ETME 335 Selection of Engineering Materials (2)**

Concepts and properties of materials and their relevance to industrial applications. Selection of metals, plastics, ceramics, composites, etc. 2 lectures. Prerequisite: ETMP 144, ETWT 144, IE 141, MET 235.

**ETME 337 Instrumentation of Mechanical Systems (3)**

Principles of process instrumentation and control. Temperature, pressure, flow and level measurement. Analytical instrumentation. Pneumatic and electric transmission devices and controllers. Signal conditioning. Recorders and indicators. 2 lectures, 1 laboratory. Prerequisite: ETEL 125, ETME 311.

**ETME 338 Industrial Engines (4)**

Types of power plants and their application to vehicles and stationary plant generators, compressors, and other industrial equipment. Includes various types of engines, turbines, boilers and some of the newer developments being applied in industry. Fuel conservation and pollution control. 3 lectures, 1 laboratory. Prerequisite: ETME 301, ETME 337.

**ETME 344 Advanced Design Drawing (2)**

Preparation of detail and assembly drawings from design layouts. Tolerances on lineal dimensions and geometric form. Surface finish symbols, production notes and parts lists. Applications of welding symbols. 2 laboratories. Prerequisite: ETME 143.

**ETME 406 Vibrations for Technology (2)**

Free and forced vibration in damped and undamped systems. Rotating balance, critical speeds, measuring and monitoring techniques, vibration and acoustical noise isolation and reduction. 2 lectures. Prerequisite: ETME 206, CE 202.

**ETME 421, 422 Applied Machine Design (4) (4)**

Machine design emphasizing properties of materials relative to structural loading and design; layout of machine elements. Laboratory includes solution of realistic design projects. 2 lectures, 2 laboratories. Prerequisite: ETME 344, ETME 320, CE 202, CE 203.

**ETME 437 Applied Fluid Power Systems (4)**

Application of hydraulic and pneumatic equipment. Design, selection and layout of devices and systems including electrical and pneumatic control logic. 2 lectures, 2 laboratories. Prerequisite: ETME 333, ETME 421.

**ETME 443 Mechanical Systems (4)**

Application of technical principles incorporating various components into an integrated system. Project design oriented activities so that the student becomes familiar with component selection and layout of mechanical systems, emphasizing industrial handbook and catalog material. 4 laboratories. Prerequisite: ETME 333, ETME 335, ETME 422.

## **ETMP—ENGINEERING TECHNOLOGY—MANUFACTURING PROCESSES**

**ETMP 121 Manufacturing Survey (1)**

Overview of manufacturing processes relating to metals and plastics. Includes study of materials, thermal cutting systems, welding, forming, machining, and foundry processes. Open to all majors. 1 lecture.

**ETMP 144 Manufacturing Processes: Machining I (2)**

Uses, capabilities, and theoretical and operational characteristics of lathe and milling machine tools, including conventional, automatic and numerical control. Study of cutting tool characteristics, cutting fluids, quality control, production methods and economics. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory.

**ETMP 145 Manufacturing Processes: Machining II (1)**

Relationship between engineering design and production fabrication. Hole forming by drilling, broaching, punching, piercing and nontraditional methods. Numerical control drilling. Forming and assembling of gage metal components. Engineering and economic significance of various production techniques. Miscellaneous course fee required—see *Class Schedule*. 1 laboratory.

**ETMP 157 Electronic Manufacturing (3)**

Design, documentation and fabrication of electronic units with emphasis on CAD/CAM. *Prototyping techniques, project planning, and production methods. Student completes working unit from start to finish in 60 hours of project-oriented laboratory.* Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

**ETMP 158 Introduction to Robotics (2)**

Introduction to applied industrial robotics. Concepts in programming, tooling and general application of robots in industry. Opportunity to program and operate full-size industrial robots. Open to all majors. 1 lecture, 1 laboratory.

**ETMP 224 Advanced Machining Technology (4)**

Theory and operational problems of manual and automatic machine tools. Evaluation of cutting tool geometry, machinability, and tool performance with conventional and exotic materials and processes. 2 lectures, 2 laboratories. Prerequisite: ETMP 144.

**ETMP 240 Additional Engineering Laboratory (1)**

Advanced production and toolroom problems. Design and construction of laboratory tooling and instrumentation. Individual and group investigation of selected problems. Total credit limited to 4 units, not more than 1 unit per quarter. Miscellaneous course fee required—see *Class Schedule*. 1 laboratory. Prerequisite: Consent of instructor.

**ETMP 245 Advanced Machining Operations (3)**

Advanced applications of conventional milling machines, turret lathes and automatic screw machines. Use of machine accessories, fixtures and attachments. Instrumentation for quality control. Nontraditional machining processes. Precision sawing and gear manufacture. 1 lecture, 2 laboratories. Prerequisite: ETMP 144.

**ETMP 246 Duct Design and Fabrication (2)**

Relationships between engineering design and production fabrication and installation. Air distribution systems, duct work, materials, commercial fabrication methods. Installation techniques and cost estimating. 1 lecture, 1 laboratory. Prerequisite: ETME 141.

**ETMP 321, 322 Tool Design (3) (3)**

Design of manufacturing tools such as jigs, fixtures, and dies. Material selection, tolerance balancing, and quality control requirements as economic design factors. Field trips to manufacturing centers. 2 lectures, 1 laboratory. Prerequisite or concurrent: ETMP 224, ETME 344 or consent of instructor.

**ETMP 325 Abrasive Machining and Finishing (2)**

Properties of abrasives for cutting tool application. Selection, care, and preparation of bonded abrasives used on machine tools. Fundamentals of machine grinding, emphasizing productivity, attainment of surface finish and comparison to other processes. 1 lecture, 1 laboratory. Prerequisite: ETMP 245.

**ETMP 336 Numerical Control Programming (3)**

In-depth study of numerical control (NC) machine tool and robot programming using computer-aided techniques. NC tooling and setups. 2 lectures, 1 laboratory. Prerequisite: ETMP 245 or consent of instructor.

**ETMP 421 Computer Aided Manufacturing Technology (3)**

Use of CAD/CAM systems to program machine tool and robot motion. Advanced COMPACT II and APT programming concepts. Design and implementation of computer driven manufacturing cells and flexible manufacturing systems. 2 lectures, 1 laboratory. Prerequisite: IE 233, ETMP 336.

**ETMP 434, 435, 436 Tool and Manufacturing Engineering (3) (3) (3)**

Construction and testing of jigs, fixtures and dies. Design and economic application of conventional, computer-aided, and specialized manufacturing processes. Application of management, communication, and quality control techniques to manufacturing projects. Field trips to manufacturing centers. 1 lecture, 2 laboratories. Prerequisite: ETMP 322.

## **ETWT—ENGINEERING TECHNOLOGY—WELDING TECHNOLOGY**

**ETWT 144 Manufacturing Processes (2)**

Theory and application of metal cutting and welding processes. Includes shielded metal arc, flux cored arc, submerged arc, gas metal arc, gas tungsten arc, brazing, resistance, and oxy-acetylene processes. Bonding theory, joint design, codes and testing. 1 lecture, 1 laboratory.

**ETWT 152 Micro Bonding (2)**

Fabrication of printed wiring boards and hybrid thick film circuits. Photo-reduction and screen printing. Hand and vapor phase soldering. Die attach, wire bonding and leak detection of microelectronic hermetic packages. 1 lecture, 1 laboratory.

**ETWT 155 Industrial Welding Technology (1)**

Application of various electric welding processes to joining of steel sheet and plate. Includes short circuiting arc, flux cored electrode, gas metal arc, and shielded metal arc processes. Gas welding of steel pipe and hard surfacing. 1 laboratory. Prerequisite: ETWT 144.

**ETWT 156 Welder Qualification Technology (1)**

Out of position fillet and groove welds in carbon steel plate. Welder qualification tests according to code requirements. 1 laboratory. Prerequisite: ETWT 144.

**ETWT 224 Weld Evaluation Methods (2)**

Methods of evaluating weld samples of ferrous and nonferrous materials. Preparation of specimens using chemical and electrolytic etching. Basic photographic techniques used to display weld samples in engineering reports. 1 lecture, 1 laboratory. Prerequisite: ETWT 144.

**ETWT 240 Additional Welding Laboratory (1)**

Individual investigation of current methods and applications. Studies of laboratory procedures and selected problems. Total credit limited to 4 units, not more than 1 unit per quarter. 1 laboratory. Prerequisite: ETWT 144 or consent of instructor.

**ETWT 259 Advanced Welding (2)**

Theory and application of various gas shielded arc welding processes to the welding of aluminum, carbon steel, and stainless steel. 1 lecture, 1 laboratory. Prerequisite: ETWT 144.

**ETWT 324 Welding Technology (4)**

Structure of metals, types of steel and their manufacture. Welding procedures, shielding flux, slags and gasses, effects of alloying elements. Metallurgy of carbon steel welds. 2 lectures, 2 laboratories. Prerequisite: MET 235 and junior standing.

**ETWT 325 Welding Technology (4)**

Mechanical properties of metals, mechanical testing. Shrinkage and distortion in weldments, current preheating and postheating practices. Weldment defects, filler materials. Welding metallurgy of carbon and low alloy high strength steels. 2 lectures, 2 laboratories. Prerequisite: ETWT 324, ETWT 259.

**ETWT 326 Welding Technology (4)**

Weldability studies of alloy steels, AWS structural code welding procedure qualification of carbon and alloy steels. Metallographic and mechanical property tests. 2 lectures, 2 laboratories. Prerequisite: ETWT 325.

**ETWT 335 Nondestructive Examination (5)**

Theory and application of nondestructive test systems for quality control. Includes radiography, ultrasonic, magnetic particle, penetrants, eddy current and holography. 2 lectures, 3 laboratories. Prerequisite: ETWT 259, PHYS 123.

**ETWT 336 Welding Power Sources (3)**

Design, selection, and application of welding power sources. Physics of the welding arc as related to power sources. 2 lectures, 1 laboratory. Prerequisite: PHYS 123, ETEL 126.

**ETWT 434 Advanced Welding Technology (4)**

Procedure and performance qualification according to ASME Pressure Vessel Code. Weldability studies of aluminum and its alloys. Cost estimating and cost reduction methods. Basic pressure vessel design. 2 lectures, 2 laboratories. Prerequisite: CE 202, CE 203, ETWT 326, PHYS 123.

**ETWT 435 Advanced Welding Technology (4)**

Weldability studies on stainless steels and copper base alloys. Design of complex weldments. Introduction to corrosion. Cost estimating. Emphasis on semiautomatic and automatic welding processes. 2 lectures, 2 laboratories. Prerequisite: CHEM 121, ETWT 434.

**ETWT 436 Advanced Welding Technology (3)**

Welding tests, brazing qualifications, weldability of dissimilar metals, quench and tempered steels, welding chambers, electron beam welding. Lab emphasis on field welding and fitting. 1 lecture, 2 laboratories. Prerequisite: ETWT 435.

## FDSC—FOOD SCIENCE

**FDSC 111 Survey of Food Industry (2)**

Introductory course including size, distribution, major production areas of the food processing industry. Not open for credit to Food Science majors who have completed more than 12 units of FDSC courses. 2 lectures.

**FDSC 122 Introductory Food Engineering (4)**

Food processing equipment, mechanical principles, equipment maintenance, and basic control devices used in food processing and preparation of fruits and vegetables for further processing (preservation). 3 lectures, 1 laboratory. Prerequisite: Completion of high school algebra or equivalent.

**FDSC 150 Processed Food Inspection (3)**

Food laws and safety regulations concerning the food industry and consumer protection. Principles of food preservation. Fundamentals and procedures for inspecting processed foods based upon federal, state and industry standards. 3 lectures.

**FDSC 200 Special Problems for Undergraduates (1-2) (CR/NC)**

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading. Prerequisite: Consent of department head.

**FDSC 209 Meat Procurement and Use (3)**

Selection, identification and cutting of meat. Physical and chemical composition of meat and its relationship to flavor, tenderness, nutritional value and related subjects. Meat inspection and grading. Credit not allowed for students having credit in FDSC 210, 2 lectures, 1 laboratory.

**FDSC 210 Meats (3)**

Meat industry processing methods and operations. Practice in slaughtering and cutting beef, pork and lamb. Meat inspection, grading, composition, curing, preservation and related topics. Credit not allowed for students having credit in FDSC 209, 2 lectures, 1 laboratory.

**FDSC 212 Meat Grading and Evaluation (2)**

Factors related to carcass quality and yield. USDA meat grading principles and practices. Judging of carcass and wholesale cuts. Field trip to meat packing plants required. 1 lecture, 1 laboratory. Prerequisite: FDSC 210.

**FDSC 230 Elements of Food Processing (4)****GEB F.2.**

Principles of unit operations in food processing covering canning, freezing, dehydration, fermentation and concentration. Food quality and spoilage. For non-food science majors only. 3 lectures, 1 laboratory.

**FDSC 241 Unit Processing Operations: Thermal Processing (4)**

Thermal processing procedures for fruits, vegetables, meats and specialty items. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite or concurrently: FDSC 122, FDSC 150.

**FDSC 243 Unit Processing Operations: Refrigeration/Freezing, Osmotic Preservation and Fermentation (4)**

Processing procedures for frozen foods, juices, jams, jellies, specialty foods and fermented foods. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite or concurrently: FDSC 122, FDSC 150.

**FDSC 245 Unit Processing Operations: Water Removal (3)**

Processing procedures for dehydrated fruits, vegetables and specialty items, as well as the concentration of liquids. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite or concurrently: FDSC 122, FDSC 150.

**FDSC 247 Unit Processing Operations: Cereal, Bakery and Food Processing Technology (4)**

Milling of wheat, rice, corn, soybean, rye and other flours. Fundamental technology of producing bakery products; sheeted and extruded snack food products. Properties of ingredients and their effect on product quality. Field trips required. 3 lectures, 1 laboratory. Prerequisite: Completion of a minimum two courses in chemistry; FDSC 230 for nonmajors.

**FDSC 321 Food Quality Control (3)**

Methods of analyzing the physical and chemical properties of foods used in the food plant quality control and product development laboratory. Includes organization of the laboratory. 2 lectures, 1 laboratory. Prerequisite: CHEM 121.

**FDSC 331 Principles of Food Plant Sanitation (3)**

Organization, management and operation of a food plant sanitation and waste disposal program. Field trips required. 3 lectures. Prerequisite: BACT 221.

**FDSC 332 Statistical Quality Control (3)**

Application of statistical methods in quality control programs and evaluation of operations. Calculator required. 3 lectures. Prerequisite: FDSC 122 and 8 units of 100–200 level FDSC courses and completion of MATH/STAT elective requirement.

**FDSC 336 Food Packaging (3)**

Packaging materials, packages and packaging methods applicable to a variety of processed foods. Field trip may be required. 3 lectures. Prerequisite: 12 units of 100–200 level FDSC courses or consent of instructor.

**FDSC 338 Meat Processing (3)**

Manufacturing of further processed meats including curing, fermenting, restructuring, smoking and cooking. Product formulation, use of equipment and product evaluation. Field trip required. 2 lectures, 1 laboratory. Prerequisite: FDSC 210 or FDSC 209.

**FDSC 341 Wines and Fermented Foods (3)**

Methods of production and testing of beer, wines and fermented foods. Field trip may be required. 3 lectures. Prerequisite: Junior standing.

**FDSC 350 Advanced Food Engineering (3)**

Principles of material and energy balance as applied to food processing systems. Calculations regarding energy requirements, heat transfer, refrigeration and freezing systems, and pumping heads will be emphasized. Process control (materials handling and transportation). Identification of food processing control points and determination of methods of control, especially computers and microprocessors, will be stressed. 3 lectures. Prerequisite: FDSC 122 and FDSC 243.

**FDSC 361 Meat Packing By-Products (2)**

Value, origin, classification and uses of meat by-products. Investigation of scientific principles and manufacturing processes. Field trips required. 1 lecture, 1 activity. Prerequisite: Junior standing, FDSC 210 or FDSC 209.

**FDSC 400 Special Problems for Advanced Undergraduates (1-2) (CR/NC)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Credit/No Credit grading. Prerequisite: Consent of department head.

**FDSC 421 Advanced Food Processing (3)**

Food processing operations with problems involving physical and chemical action of the processes. Field trips may be required. 2 lectures, 1 laboratory. Prerequisite: FDSC 241 and FDSC 245.

**FDSC 422 Food Composition Science (4)**

Function and properties of carbohydrates, proteins, fats, pigments and other food ingredients used in the formulation and processing of foods. 3 lectures, 1 laboratory. Prerequisite: CHEM 121, FDSC 321 or consent of instructor.

**FDSC 425 Sensory Evaluation of Food (3)**

Characteristics of food color, consistency, texture and flavor. Sensory evaluation and grading, food acceptance testing and statistical analysis of data. 2 lectures, 1 laboratory. Prerequisite: Junior standing and FDSC 332 or STAT 211.

**FDSC 431 Advanced Meats (3)**

Physical and chemical properties of meats and meat products. Quality control and special problems associated with the processing and distribution of meats. 2 lectures, 1 laboratory. Prerequisite: Junior standing, FDSC 210 or FDSC 209.

**FDSC 433 Food Processing Management (3)**

Food plant layout and flow lines, evolutionary operations technique, unit cost accounting, work simplification and scheduling. 3 lectures. Prerequisite: Junior standing and consent of instructor.

**FDSC 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum of 120 hours total time. Prerequisite: FDSC 321, FDSC 332 and ENGL 215 or ENGL 218.

**FDSC 463 Undergraduate Seminar (2) (CR/NC)**

Exploration of students' career opportunities and factors to be considered in career decisions. Focus on skills for obtaining appropriate entry level positions. Designed to meet needs of FDSC and DFA majors. Credit/No Credit grading. 2 seminars. Prerequisite: Senior standing.

**FDSC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**FDSC 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**FDSC 581 Graduate Seminar in Food Processing (3)**

Current findings and research problems in the field and their application to the industry. 3 seminars. Prerequisite: Graduate standing and consent of instructor.

## FIN—FINANCIAL MANAGEMENT

### **FIN 201 Survey of Securities Investments (3)**

Security types available for investment, sources of investment information, operation of security markets. Basic types of approach to investment determination, fundamental and technical approaches. 3 lectures.

### **FIN 330 Real Estate Principles (4)**

Introduction to the field of real estate providing a basic background for further study. Includes legal aspects, financing, valuation, economics, public control, title insurance and escrow, closing, safeguards for the buyer of real estate, investment, and leasing. 4 lectures. Prerequisite: BUS 201 or BUS 207. Junior standing required.

### **FIN 332 Real Estate Finance (4)**

Analysis of the relationship between national and local money markets. Real estate financing techniques, sources of funds, government participation, legal instruments of finance. 4 lectures. Prerequisite: FIN 330.

### **FIN 334 Real Estate Investment (4)**

Effects of federal, state and local taxes on investment transactions. Intensive investigation and computer analysis of urban investment opportunities. Problems in exchanging and property management. 4 lectures. Prerequisite: FIN 330, FIN 332 recommended.

### **FIN 342 Financial Management (4)**

Theory and applications of financing business operations. Financial management of current and fixed assets from internal and external sources. Analysis, planning, control, and problem solving. 4 lectures. Prerequisite: MATH 221. ACTG 301 recommended. Junior standing required.

### **FIN 411 Security Analysis and Portfolio Management (4)**

Analysis of securities, markets, and valuation. Security price movements related to money and capital market factors and corporate events. Portfolio planning, risk, media, and objectives of individual and institutional investors. 4 lectures. Prerequisite: ECON 337, FIN 342, STAT 252.

### **FIN 412 Law of Real Property (4)**

Legal problems of acquisition, ownership and transfer of real property. Contracts, agency, estates, and co-ownership, mortgages and deeds, covenants, conventions, and restrictions, easements, landlord-tenant, and zoning. 4 lectures.

### **FIN 420 Management of Financial Institutions (4)**

Analysis of practices and policies of financial institutions. Commercial banks, thrift institutions, insurance companies, investment bankers, and security dealers. Management policies resulting from the legal, competitive and economic environment in which each type of institution operates. 4 lectures. Prerequisite: ECON 337, FIN 342.

### **FIN 430 International Business Finance (4)**

Financial management of international business. Topics include the international capital and money markets, international financial institutions, special problems in evaluating direct foreign investment, and financial techniques used in international business operations. 4 lectures. Prerequisite: FIN 342.

### **FIN 440 Commercial Bank Management (4)**

Analysis of the management of a commercial bank as a profit-making entity. Emphasis put on cases in bank management, especially those which deal with the management of a bank's asset and liability structure. 4 lectures. Prerequisite: Senior standing, FIN 342, FIN 411, and ECON 337.

### **FIN 466 Financial Management II (4)**

Development of analytical and decision-making techniques in applying financial theory to business management problems. Cost of capital, capital structure, capital budgeting, risk and valuation theory. Analysis of cases to emphasize practical problems. 4 lectures. Prerequisite: FIN 342, ECON 337.

### **FIN 480 Advanced Seminar in Investment (4)**

Current topics in investments. An in-depth analysis of the efficient markets hypothesis and capital market theory. 4 seminars. Prerequisite: FIN 411.

## FOR—FOREST RESOURCES

### **FOR 100 Forest Resources Enterprise Project (1–4) (CR/NC)**

Selection and completion of a forest management/production project under faculty supervision. Project participation is voluntary and subject to approval by the department head and the Cal Poly Foundation. Degree credit limited to 12 units. Credit/No Credit grading only.

### **FOR 120 Fisheries and Wildlife Management (3) (Also listed as CONS 120)**

Survey of fisheries and wildlife resources and management practices. Relationships to recreational values, land management, food production, and preservation. 3 lectures.

### **FOR 201 Forest Resources (3)**

Fundamentals of forestry including basic silviculture, forest protection, measurement and policy. Multiple use of forest lands for water production, forage, recreation, wildlife, and timber. 3 lectures.

### **FOR 204 Resource Fire Control (2)**

Basic fire control techniques used on various wildland fuels. Elementary fire physics, fuels, weather, fire behavior, line construction, mop-up, fire line safety, and fire organization. 1 lecture, 1 laboratory. Prerequisite: FOR 201 or consent of instructor.

### **FOR 205 Fire Ecology (3)**

Fire effects on the environment; prescribed use of fire in management; policy and objectives of fire management organizations. 2 lectures, 1 laboratory. Prerequisite: NRM 304 or ecology course, and FOR 204 or consent of instructor.

### **FOR 208 Dendrology (4)**

Identification, classification, silvical characteristics, distribution, environmental requirements and economic importance of trees and shrubs in parks, forest and wildlife areas of the United States. Emphasis on Pacific Coast species. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: BOT 123.

### **FOR 225 Forestry Environmental Impacts (3)**

Impacts of forestry practices on riparian zones and meadows and their vegetation. Discussion includes snag and log management. 3 lectures. Prerequisite: NRM 304 or consent of instructor.

### **FOR 250 Survey and Management of Mediterranean Ecosystems (2)**

Shrubby vegetation found in worldwide Mediterranean ecosystems. Distribution, historical development and use of these ecosystems. Fire influences and fire management problems. Animal use and other management problems. 2 lectures.

### **FOR 290 Intercollegiate Forestry Activities (2) (CR–NC)**

Beginning through advanced skills in the event areas of college forestry activities. Instruction in use of specialized equipment and safety. Minimum of 8 hours of laboratory per week. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Enrollment limited to those qualified to compete in intercollegiate forestry activities and consent of instructor.

### **FOR 300 Computer Applications in Resource Management (2) (Also listed as NRM 300)**

Resource Management applications of microcomputers. Software programs include forest and natural resource management planning, forecasting, analysis of systems, and resource data base management for multiple use objectives. Forestry and Natural Resource examples will be used. 1 lecture, 1 laboratory. Prerequisite: CSC 110, junior standing or consent of instructor.

### **FOR 303 Forest Protection (4)**

Impact and losses to forested areas caused by physical and biotic agents (such as insects and diseases) other than fire; relation of direct and indirect control practices to forest management. Saturday field trips required. 3 lectures, 1 laboratory. Prerequisite: NRM 304 or consent of instructor.

### **FOR 305 Forest Harvesting (4)**

Relationships between forest production and harvesting methods, preparation of timber harvest plans, site preparation, harvesting effects, and cost analysis of harvesting methods. Field trip between winter and spring quarters to visit timber operations. 3 lectures and required field trip. Prerequisite: Junior standing in Forest Resources Management concentration or consent of instructor.



**FOR 314 Forest Mensuration (5)**

Methods and principles of measurement for contents of trees, stands and felled timber, construction and use of volume tables, use of statistical measures, log scaling and sampling techniques. Includes measurement of understory vegetation and other forest attributes. 3 lectures, 2 laboratories. Weekend field trips required. Prerequisite: MATH 120, STAT 212, and AE 237.

**FOR 316 Growth and Yield (3)**

Site, growth and yield mensuration and prediction; techniques of growth determination for plantations, even aged and all aged forests. Thinnings and growth response. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FOR 314.

**FOR 325 Woodlot Management (3)**

Understanding farm and small forest holdings; measurement, care and improvement of existing woodlots; fuel and product uses; establishment of new woodlands; woodland management design and plans. Integration with range and wildlife values. 2 lectures, 1 laboratory. Prerequisite: FOR 201 or consent of instructor.

**FOR 332 Forest Products (3)**

Manufacturing and marketing of wood products, wood identification, study of wood structure and mechanical properties. Weekend field trip required. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: PHYS 121, FOR 201, FOR 208.

**FOR 333 Hardwood Management (3)**

Examination of hardwood forest types including their historical development, management, protection, measurement, and utilization. Discussion and mediation of land use conflicts among public resource agencies, private companies, landowners, and governments representing views of ranchers, wildlife managers, foresters, environmental groups, recreation, etc. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FOR 208 or consent of instructor.

**FOR 336 Forest Residue Utilization (2)**

Present and potential uses of residue produced by forest utilization. Mill and field residue for small to large scale operations included. Investigate technologies available and under development for increasing utilization standards. 1 lecture, 1 laboratory. Extended field trips required. Prerequisite: FOR 305, FOR 332.

**FOR 339 Internship in Forest Resources (1-12) (CR/NC)**

Selected students will spend up to 12 weeks with an approved forest or natural resources firm engaged in production management or related business. Applying and developing production management and managerial skills and abilities. One unit of credit may be allowed for each full week of completed and reported internship. Credit/No Credit grading. Prerequisite: Consent of instructor.

**FOR 340 Resource Fire Management (2)**

Advanced study of wildland fuels, fire weather, fire behavior, and fire danger ratings in the chaparral, grassland, and wooded areas of forests, parks, and wildlands. Management implications. Saturday field trips may be required. 2 lectures. Prerequisite: FOR 204 or consent of instructor.

**FOR 345 Chaparral Management (3)**

Chaparral community management techniques, management alternatives and the effects of management on fire, water production, erosion and potential utilization of the biomass. 2 lectures, 1 laboratory. Prerequisite: NRM 304 or consent of instructor.

**FOR 350 Community Forestry (3)**

Establishment and management of city forests, wood lots, small forest holdings, shelter belts, and plantings for erosion control, wildlife enhancement, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use, fire hazard, watershed, and societal values. 2 lectures, 1 laboratory. Prerequisite: FOR 208.

**FOR 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**FOR 407 Silviculture (4)**

Interaction of forest and chaparral plant communities within the environment; influence of external factors upon wildlands, particularly those suited to forestry practices; growth and development of individual plants; origin, development, cultural practices and tolerance of forest and chaparral plant communities. Impacts of intermediate and harvest treatments on wildlife, watershed, recreation, and range resources. Saturday field trips required. 3 lectures, 1 laboratory. Prerequisite: FOR 208.

**FOR 415 Forest Valuation (3)**

Wildland and timber appraisal, wildland taxation. Financial and business aspects of forestry. Economic alternatives in addition to timber production. 2 lectures, 1 laboratory. Prerequisite: NRM 401, FOR 407.

**FOR 417 Forest Resource Management (4)**

Methods of organizing forest resources for sustained yield management; regulation of annual cut, determination or rotation and cutting cycles, and preparation of management plans. Discussion of Forestry Practices Act; Impact of timber management decisions on wildlife, recreation, range, and watershed resources; importance of human relations and communication. Saturday field trips required. 3 lectures, 1 laboratory. Prerequisite: FOR 316, FOR 407.

**FOR 434 Tree Growth and Wood Properties (3)**

Physiology of wood formation, effects of hereditary and environmental factors on the structure, properties and uses of wood. 2 lectures, 1 laboratory. Prerequisite: FOR 201, FOR 208, and FOR 332.

**FOR 438, 439 Wood Energy Systems I, II (3) (3)**

Silvicultural aspects of biomass plantation systems. Evaluate species selection, soil, site and climatic requirements; design and implementation criteria for plantation growth, energy yield and measurement, harvest, utilization, combustion and conversion, economic, sociopolitical, institutional and environmental constraints. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FOR 336, FOR 407 and PHYS 122.

**FOR 440 Watershed Management (4)**

Introduction to concepts of the hydrologic cycle and measurement of its components. Analysis of streamflow with emphasis on surface water behavior as affected by land management practices. 3 lectures, 1 laboratory. Saturday field trips required. Prerequisite: SS 121 and NRM 304.

**FOR 441 Forest and Range Hydrology (3)**

Influence of forest and range vegetation on wildland water resources for optimum production and regulation of water yields. Hydrograph analysis. Erosion, sedimentation and other water quality aspects of land use; sampling techniques. 2 lectures, 1 laboratory. Prerequisite: FOR 440.

**FOR 442 Watershed Protection (3)**

Techniques for managing wildlands for increases in usable water yields and predicting impacts of land management practices. Watershed protection and rehabilitation; analytical evaluation and prediction of watershed disturbances. 2 lectures, 1 laboratory. Saturday field trips required. Prerequisite: FOR 440.

**FOR 450 Urban Forestry (3)**

Establishment and management of city forests, wood lots, small forest holdings, shelter belts, and plantings for erosion control, wildlife enhancement, and pollution abatement. Management of forest areas requiring special attention because of heavy recreational use, fire hazard, watershed, and societal values. 2 lectures, 1 laboratory. Prerequisite: FOR 208.

**FOR 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**FOR 463 Undergraduate Seminar (2)**

Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 2 seminars.

**FOR 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

**FOR 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**FOR 500 Individual Study (1-3)**

Advanced independent study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Total credit limited to 4 units. Prerequisite: Graduate standing and consent of department head.

**FOR 504 Agroforestry Systems (3)**

Principles and practical applications of tree crop systems which are managed to provide fuel, fiber, fodder, and food. Tree crop identification and tree product uses. Plantation design, establishment, and cultural practices. Soil management. Integration of forest, and range management practices and values. Prerequisite: Graduate standing or consent of instructor.

**FOR 506 World Forestry in Social Context (3)**

Problems in design and implementation of technical assistance projects. How social elements impact technical aspects of development programs. Social forestry, community development and extension techniques to coordinate social and technical aspects of development. 3 lectures. Prerequisite: FOR 504 or consent of instructor.

**FOR 570 Selected Topics in Forest Resources (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 9 units. 1-3 lectures. Prerequisite: Graduate standing or consent of instructor.

**FOR 571 Selected Topics in Forest Resources Laboratory (3)**

Directed group laboratory of selected topics for advanced students. *Class Schedule* will list topic selected. Total credit limited to 9 units. 1-3 laboratories. Prerequisite: Graduate standing and consent of instructor.

**FOR 581 Graduate Seminar in Forest Resources (3)**

Group study of selected developments, trends and problems in the field of forest resources. 3 seminars. Prerequisite: Graduate standing.

**FORL—FOREIGN LANGUAGE****FORL 101, 102, 103 Foreign Language (3) (3) (3)****GEB C.3.**

Organized group instruction arranged for students who wish to acquire basic skill in a foreign language indicated by subtitle. Not open for credit by examination. To be taken in numerical sequence. 3 lectures.

**FORL 303 Culture (3)**

Aspects of cultures of the French-, German-, or Spanish-speaking peoples. History, society, political movements, art, music and literature are discussed. Topic and language of instruction vary to provide specific focus. 3 lectures. Prerequisite: FR, GER or SPAN 203, 223, depending on language offered, equivalent, or consent of instructor.

**FORL 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Repeatable to 8 units. Prerequisite: Consent of department head.

**FORL 401 Translation (4)**

Practice in translating from English to the foreign language indicated by subtitle, and from the foreign language to English. Vocabulary development including focus on idioms, analysis of style, and grammatical analysis as a function of the techniques of translation. 4 lectures. Prerequisite: FR 301, GER 301, SPAN 301 depending on language, or consent of instructor.

**FORL 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**FR—FRENCH****FR 101, 102, 103 Elementary French (5) (5) (5)****GEB C.3.**

For beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. To be taken in numerical sequence. 4 lectures, 1 activity.

**FR 104 Intensive Elementary French (15)**

Class practice in pronunciation, syntax, reading, writing and conversation including appropriate cultural information. Offered in summer only. Laboratory drill required. 15 lectures.

**FR 201, 202, 203 Intermediate French (3) (3) (3)****GEB C.3.**

Review of French grammar and practice in writing and oral expression based on social and cultural values. 3 lectures. Prerequisite: FR 103 or consent of instructor.

**FR 221, 222, 223 French Conversation (2) (2) (2)**

Current idiomatic usage with emphasis on contemporary culture. Written compositions to supplement oral intensive classroom practice. 2 lectures. Prerequisite: FR 103 or consent of instructor. Simultaneous enrollment in FR 201, FR 202, FR 203 recommended.

**FR 301 Advanced French Composition and Grammar (4)**

Oral and written development of structural grammar, syntax and complex components of French. Expansion of vocabulary and idiomatic expressions through text study. Translation from English to French and written composition. 4 lectures. Prerequisite: FR 203 or equivalent.

**FR 302 Advanced French Conversation and Grammar (4)**

Topics based on student interest. Outlines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: FR 203, FR 223, equivalent, or consent of instructor.

**FR 305 Significant Writers in French (4)****GEB C.3.**

Understanding critical analysis and oral discussion of poetry, essays, novels, plays. Each course will have a subtitle descriptive of the content. May be repeated to 12 units. 4 lectures. Prerequisite: FR 203 or equivalent.

**FR 405 French Literature in English Translation (3)****GEB C.3.**

Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding French writers. Lecture in English. For minor credit, reading and written assignments must be done in French. *Class Schedule* will list topics selected. 3 lectures. Prerequisite: Consent of instructor.

**FR 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

## FRSC—FRUIT SCIENCE

### FRSC 123 Beekeeping (3)

Practical studies and exercises in the handling of honey bees with special reference to pollination of commercial crops. Honey processing and marketing. Bee inspection and disease detection. 2 lectures, 1 laboratory.

### FRSC 131 Pomology (4)

History and outlook for California fruit growing. General principles of fruit production. Field laboratories in orchard management practices, tree and fruit identification, harvesting, grading and packing of university orchard products. Field trip required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Credit will not be allowed for both FRSC 131 and FRSC 230.

### FRSC 132 Pomology (4)

Training and pruning of deciduous fruits. Culture of pome, stone and miscellaneous fruit species. Saturday lab may be required. 3 lectures, 1 laboratory. Prerequisite: FRSC 131.

### FRSC 133 Pomology (4)

Production practices common to deciduous nut crops produced in California. Normal spring cultural problems including thinning and spraying. Small fruit culture. 3 lectures, 1 laboratory. Prerequisite: FRSC 132.

### FRSC 230 California Fruit Growing (4)

GEB F.2.

Production practices, areas of production, suitable varieties, harvest and processing of important deciduous and subtropical fruit crops. Methods of propagation and training. 3 lectures, 1 laboratory. Credit will not be allowed for both FRSC 131 and FRSC 230.

### FRSC 231 Viticulture (4)

Growing wine, raisin and table varieties of grapes. Techniques in harvesting and handling, utilizing the university planting. 3 lectures, 1 laboratory.

### FRSC 232 Citrus and Avocado Fruit Production (4)

Growing and marketing oranges, lemons, grapefruit, tangerines, limes and avocados. Minor citrus species, rootstocks and ornamental types included. Orchard practice. Field trip to a major California production area required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory.

### FRSC 331 Advanced Viticulture (4)

Commercial production practices, mechanization and processing. Utilization of university vineyards for propagation, planting, training and pruning of grape vines. 3 lectures, 1 laboratory. Prerequisite: FRSC 231.

### FRSC 332 Fruit Plant Propagation (4)

Propagation by seed, cuttings, layering, grafting, and budding. Rootstocks for deciduous fruits, commercial nursery practices. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: FRSC 100- or 200-level course or consent of instructor.

### FRSC 421 Advanced Pomology (4)

Storage and transportation of fruits, postharvest physiology and technology, advanced methods of fruit production. Field trip may be required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: FRSC 131 or consent of instructor.

### FRSC 424 Tropical Fruit and Nut Production (4)

Common practices in producing tree and fruit crops of economic importance in tropical areas—cocoa, tea, coffee, pineapple, mango, bananas, coconut, and papaya. 3 lectures, 1 activity. Prerequisite: FRSC 100- or 200-level course or consent of instructor.

### FRSC 436 Orchard Management (4)

Organization and management of labor and equipment in field and processing operations. Production problem analysis. Advanced work in production management. Job instruction training. 3 lectures, 1 laboratory. Prerequisite: FRSC 421.

**FRSC 521 Advanced Fruit and Nut Crop Production (4)**

Advanced commercial production and management techniques. Use of mechanical aids and harvesters as related to size of crops, harvesting, and post-harvest handling. 3 seminars, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.

**FRSC 581 Graduate Seminar in Fruit Production (3)**

Group study of current problems of fruit production; current experimental and research findings as applied to production and marketing. 3 seminars. Prerequisite: Graduate standing.

**GEOG—GEOGRAPHY****GEOG 150 Human Geography (3)****GEB D.4.a.**

Introduction to the basic concepts and content of human geography. Survey of the field with emphasis on the cultural universals of language, religion, systems of government, and economic activities. 3 lectures.

**GEOG 215 Human Impact on the Earth (3)**

Global assessment of human impact upon vegetation, animals, soils, water and atmosphere. Emphasis on problems stemming from the interactions of technology, population growth and natural resources. 3 lectures.

**GEOG 250 Physical Geography (3)**

Emphasizes the origins of the Earth's physical diversity. Seeks to account for the distribution and interrelationships of the Earth's diverse patterns of climate, landforms, vegetation and soils. 3 lectures.

**GEOG 305 Political Geography (3)**

Spatial influences on man's political behavior. Geopolitics, boundaries, significance of resources on power politics, internal spatial structure of the nation-state, relationships between nation-states. 3 lectures. Prerequisite: Junior standing.

**GEOG 308 Global Geography (3)****GEB D.4.b.**

Survey of principal elements of global geography. Interrelations of human activities and natural elements as related to international developments and trends. Focus on selected regional examples. 3 lectures. Prerequisite: Junior standing.

**GEOG 310 Urban Geography (3)**

Presentation of geographic concepts, principles, and generalizations related to urban functions, forms, distribution, and growth. Location, areal extent, and interaction among the various urban functions. 3 lectures. Prerequisite: Junior standing.

**GEOG 315 Geography of Resource Utilization (3)**

World view of the interconnections of the following resource systems: food, energy, water and nonfuel minerals. Pervading theme: causes and characteristics of the great disparities in global living standards. 3 lectures. Prerequisite: Junior standing.

**GEOG 320 Geography of Hunger (3)**

Geographic analysis of the world problem of hunger that considers the factors of environmental deterioration, energy deficiencies, the Green Revolution, and rapid population growth. Underdeveloped world and the cultural and physical restraints it must overcome to adequately feed a growing population. 3 lectures. Prerequisite: Junior standing.

**GEOG 325 Climate and Humanity (3)**

Geographic perspective on the interrelationships between climate and humanity. Effects of people on climate and the influence of climate and weather upon human activities and behavior. Focus on global human conditions which are responsible for the alteration of climate and in turn are vulnerable to climate change. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**GEOG 340 Geography of California (3)**

Physical environment of California; patterns of settlement and economic development; current problems. 3 lectures. Prerequisite: Junior standing.

**GEOG 350 Geography of the United States (3)**

People, land utilization, and economic development viewed against the background of the physical environment. Topically and regionally organized. Pervading themes include current problems and regional cultural distinctiveness. 3 lectures. Prerequisite: Junior standing.

**GEOG 401 Area Geography (3)**

Detailed study of geographic characteristics of a selected world area. Each time the course is offered it will bear a subtitle descriptive of the particular world area studied. 3 lectures. May be repeated to a total of 12 units. Prerequisite: Junior standing.

**GEOG 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**GEOLOGY—GEOLOGY**

**GEOLOGY 201 Physical Geology (3)**

**GEB B.1.a.**

Processes responsible for the Earth's rocks, structure and surface features. Volcanism. Mountain building. Plate tectonics, weathering. Erosion and deposition by streams, glaciers, wind and waves. 3 lectures.

**GEOLOGY 203 Fossils and the History of Life (3)**

**GEB B.1.a.**

Fossil record. Mechanisms and patterns of evolution. Adaptation of ancient organisms to their environments. Fossils in the interpretation of earth history. Important events in the history of life. Historical development of the major groups of invertebrates, vertebrates, and plants. 3 lectures.

**GEOLOGY 204 Geologic History of California (3)**

**GEB B.1.a.**

Development of California through geologic time. Where and why the rocks appeared. Movement on faults, and mountain building. Geologic processes at work today and yesterday. Relationship of California geology to the rest of the world. 3 lectures. Prerequisite: GEOLOGY 201 recommended.

**GEOLOGY 205 Earthquakes and Earth Hazards (3)**

**GEB B.1.a.**

Plate tectonics, seismicity and faulting. Quake mechanisms, intensity and magnitude. Measurement and prediction. History. Prevention and planning. Related geological effects. 3 lectures.

**GEOLOGY 206 Geologic Excursions (1) (CR/NC)**

**GEB B.1.a.**

Field trips to places of geologic interest. Class schedule will indicate destinations of the trips. Students provide their own transportation, food, and camping equipment. Course may be repeated for a maximum of 3 units provided field trips are taken to different locations. Credit/No Credit grading. 1 laboratory. Recommended prerequisite or concurrent: GEOLOGY 201 or GEOLOGY 204.

**GEOLOGY 211 Cities and Geology (3)**

**GEB B.1.a.**

Relation of city sites to geology. Planning and geology. Hydrogeology. Foundations of cities. Excavations. Building materials. Urban geological hazards. Case histories and lessons for the future. 3 lectures.

**GEOLOGY 241 Physical Geology Laboratory (1)**

**GEB B.1.a.**

Properties and identification of minerals and rocks. Topographic maps and landform analysis. Geologic maps and interpretation of rock structure. 1 laboratory. Prerequisite or concurrent: GEOLOGY 201.

**GEOLOGY 302 Geological Resources (3)**

**GEB B.1.a.**

Nature of the planet's natural mineral resources. Mode of occurrence, geology, origins and quantity of ores, fossil fuels, and industrial minerals. Exploration methods and prospecting. World supply of geological resources. 3 lectures. Prerequisite: Introductory science course.

**GEOLOGY 321 Marine Geology (4)**

Techniques of ocean floor exploration, nearshore sedimentary processes and shoreline evolution, continental margin sediments and geologic history, ocean floor topography and sediments, origin and evolution of ocean basins, physical resources of the ocean. 3 lectures, 1 activity. Prerequisite: GEOLOGY 201 or consent of instructor.

## GER—GERMAN

### GER 101, 102, 103 Elementary German (5) (5) (5) GEB C.3.

For beginners. Class practice in pronunciation, sentence structure, reading, writing and basic conversation. Laboratory drill required. To be taken in numerical sequence. 4 lectures, 1 activity.

### GER 201, 202, 203 Intermediate German (3) (3) (3) GEB C.3.

Review of German grammar and practice in writing and oral expression based on social and cultural values. 3 lectures. Prerequisite: GER 103 or consent of instructor. Simultaneous enrollment in GER 221, GER 222, GER 223 recommended.

### GER 221, 222, 223 German Conversation (2) (2) (2)

Current idiomatic usage with emphasis on contemporary culture. Written compositions to supplement intensive oral classroom practice. 2 lectures. Prerequisite: GER 103 or consent of instructor. Simultaneous enrollment in GER 201, GER 202, GER 203 recommended.

### GER 301 Advanced German Composition and Grammar (4)

Oral and written development of structural grammar, syntax and complex components of German. Vocabulary expansion and idiomatic construction. Written compositions. Translations to examine linguistic and semantic differences. 4 lectures. Prerequisite: GER 203 or equivalent.

### GER 302 Advanced German Conversation and Grammar (4)

Topics based on student interest. Outlines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: GER 203, GER 223, equivalent, or consent of instructor.

### GER 305 Significant Writers in German (4) GEB C.3.

Representative writers or literary period. Each course will have a subtitle descriptive of the content. May be repeated to 12 units. 4 lectures. Prerequisite: GER 203 or equivalent, or consent of instructor.

### GER 405 German Literature in English Translation (3) GEB C.3.

Selected works to be read in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding German writers. Lecture in English. For minor credit, reading and written assignments must be done in German. *Class Schedule* will list topics selected. 3 lectures. Prerequisite: Consent of instructor.

### GER 470 Selected Advanced Topics (1-4)

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

## GRC—GRAPHIC COMMUNICATION

### GRC 101 Introduction to Graphic Communication (2)

Orientation to the Graphic Communication program. Examination of the industry, its traditions, technological changes, and employment opportunities. 2 lectures.

### GRC 122 Design with Type (5)

Introduction to typographic principles and practices. Spacing, type selection, copyfitting, and mark-up systems. History of letterforms. Fundamentals of layout and design for mass print media. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 2 laboratories.

### GRC 127 Graphic Arts Processes (3)

Introduction to the graphic arts. Printing processes, design, layout, composition, presswork, cold type, binding, silk screen, offset, photography, and duplicating processes. For nonmajors. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory.

### GRC 137 Packaging Graphics (3)

Introduction to the major substrates and printing processes used for package printing. Technical aspects of the printing processes to include gravure, flexography and lithography. Technical design considerations of packaging structure and graphics. Not for Graphic Communication majors. 3 lectures.



**GRC 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**GRC 204 Introduction to Printing Management (3)**

Structure of the industry. Production systems analysis, trade customs, and applied management. 3 lectures.

**GRC 222 Advanced Design with Type (3)**

Typographic principles, practice and design of complex text, display and tabular composition for mass print media. Copy markup and layout procedures for electronic composition, with consideration of printing process requirements. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: GRC 122.

**GRC 223 Copy Preparation (3)**

Preparation of line and tone copy for the reproduction processes. Designing roughs and visuals and preparation of single- and multi-color mechanicals. Production planning. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory.

**GRC 227 Process Camera—Black and White (3)**

Characteristics of photographic materials and equipment used in the graphic arts and their evaluation. Theory and practice in the use of the process camera for the production of line and halftone work. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory.

**GRC 300 Composition Systems I (2)**

Introduction to composition systems. Electronic terminal entry of newspaper, commercial, publishing and packaging composition. Methods and operating characteristics of photocomposition typesetting equipment. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: GRC 122 or consent of instructor.

**GRC 301 Composition Systems II (4)**

Modern composition systems for display and text. First and second generation phototypesetting machines. Computerized photocomposition systems. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 300.

**GRC 302 New Technologies in Graphic Communication (3)**

New graphic communication technologies that are impacting the methods and procedures of producing and distributing print media. Application of computers and electronics, laser beams, telecommunication, photo-optics integrated systems, robotics, and related technologies. Prerequisite: GRC 415 or junior standing.

**GRC 311 Substrates and Ink (3)**

Introduction to technical aspects of paper, other substrates, and ink used in the printing industry. Manufacture, testing, and interaction of these materials are examined in relation to particular processes and end use requirements. 2 lectures, 1 activity.

**GRC 323 Pre-Separated Art for Camera (3)**

Manual preparation and separation of line and continuous tone images for multicolor reproduction. Preparation of complex full-color mechanical layouts. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: GRC 223.

**GRC 324 Finishing Processes (4)**

Effective imposition techniques. Cutting, folding, assembling of folded material, finishing operations. Case and perfect bookbinding. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories.

**GRC 326 Printing Equipment Management (3)**

Procedures in designing, maintaining and decision making for printing equipment including pneumatics, hydraulics, mechanical and electrical systems. Pollution, safety and training in the graphic communication industry. 2 lectures, 1 activity. Prerequisite: GRC 204 and junior standing.

**GRC 328 Image Assembly and Platemaking (4)**

Planning for lithographic press plates. Ruling, scribing, opaquing, and retouching negatives and positives. Preparation of supports for black and white and color imaging. Image assembly for large presses. Black and white and color proofing techniques. Preparation of various offset plates. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 227 or consent of instructor.

**GRC 331 Color and Quality Control (3)**

Introduction of color sciences and quality control techniques as they relate to the printing and allied industries. Application of theory to problems such as color reproduction, color control, print inspection, process control, and quality measurement. Management aspects of quality control. 2 lectures, 1 laboratory. Prerequisite: Junior standing and STAT 211.

**GRC 333 Plant Organization and Layout (3)**

Printing plant design and layout. Production analysis, work flow patterns, and utilization of space. Organization of plant services. 2 lectures, 1 activity.

**GRC 335 Line and Halftone Media (4)**

Preparation and evaluation of original art copy for commercial use. Laboratory problems in drawing and layout for single and multiple color runs. Various approaches to registration; uses of color and texture in art copy. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 323 or consent of instructor.

**GRC 336 Modern Copy Technology (4)**

Preparation and evaluation of current and experimental typographic images for the major printing processes; pagination and typographic modification by electronic means. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 301, GRC 335.

**GRC 337 Color Separation Systems (2)**

Exploration of color separation systems, including optical and electronic methods. Standards for color reproduction. Examination of electronic prepress systems. Preparation of color proofs. Quality control procedures. 1 lecture, 1 laboratory. Prerequisite: GRC 227.

**GRC 347 Electronic Copy Production (2)**

Preparing text and display copy for entry into video display terminals. Editing and copy revision techniques, system analysis of stand-alone and on-line devices. Entry to photocomposition systems and advertising display terminals. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: Junior standing or consent of instructor.

**GRC 357 Screen Processes (2)**

Screen process reproduction methods with applications to industry and communication. Includes paper, tusche, knife-cut and photographic stencils. Printing mediums, surfaces, and industrial applications such as printed circuits and packaging. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: GRC 328 or consent of instructor.

**GRC 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**GRC 401 Printing Marketing and Sales (3)**

Introduction to printing marketing and sales management. Graphic communication market determination, market strategy, and implementation. Salesmanship, sales forecasting techniques for printed products. 2 lectures, 1 activity. Prerequisite: Senior or advanced junior standing.

**GRC 403 Estimating (3)**

Estimating the cost of various kinds of printed products. Analysis of material, labor and other cost factors. Use of budgeted hour costs and production standards. Computer assisted estimating. 3 lectures, 1 laboratory. Prerequisite: GRC 311 or junior standing.

**GRC 408 Newspaper and Publications Management (3)**

Analysis of newspaper and publications production systems. Organization of the production function. Personnel and industrial problems peculiar to the industry. 3 lectures. Prerequisite: Senior standing or consent of instructor.

**GRC 411 Estimating, Pricing and Costing (4)**

Development of printing plant estimating standards. Coordination of estimating and sales to printing market trends. Printing industry management ratios related to management and profit strategy. Costing techniques in the printing plant. Estimating for web processes including color impositions. Computer applications to estimating. 4 lectures. Prerequisite: GRC 403.

**GRC 415 Offset Lithographic Presswork (5)**

Introduction to the use of sheetfed offset presses. Investigation of dampening, inking sheet control systems. Process color. Control of press variables. Computerized press controls, scanning densitometers. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 2 laboratories. Prerequisite: GRC 328 or consent of instructor.

**GRC 416 Web Printing Technology (5)**

Theory and practice in the use of web presses for letterpress, offset, rotogravure, and flexographic printing. Applications for newspapers, packaging, business forms, magazines, books, catalogs and advertising materials. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 2 laboratories. Prerequisite: GRC 415.

**GRC 417 Advanced Web Printing Technology (2)**

Advanced theory and applications of web printing technology to include copy and design reproduction and management decisions as they pertain to the graphic communication field. 2 lectures. Prerequisite: GRC 223, GRC 416.

**GRC 421 Printing Management (4)**

Principles and applications of printing production forecasting. Functions of printing production control. Printing production records. Establishment of inspection standards. Judgment and measurement inspection. 3 lectures, 1 activity. Prerequisite: GRC 204.

**GRC 422 Printing Management (3)**

Applied techniques of printing plant personnel management. Investigation and determination of job descriptions, testing for staff and line employees. Setup of graphic arts in-plant training programs. Evaluation procedures for personnel working in the printing facility. Printing industry association relationships. 2 lectures, 1 laboratory. Prerequisite: GRC 204.

**GRC 423 Printing Management (4)**

Trends in the graphic arts labor movement. Graphic arts labor unions. Collective bargaining and grievance procedures practiced in the printing industry. Administration of the labor contract by printing plant supervisor. Industry-specific case problems. 3 lectures, 1 activity. Prerequisite: GRC 204.

**GRC 429 Computer Imaging (3)**

Computer imaging systems in graphic communication. Digital typesetting, CAD systems, integrated pre-press systems, page makeup devices, scanners, monochrome and color terminals, interfacing, and electronic publishing systems. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: GRC 301.

**GRC 432 Analytical Methods for Printing (4)**

Mathematical and graphical models for printing technology and management. Optimization of printing manufacturing through the application of modeling techniques to graphic reproduction and production. Analysis of alternative equipment, method, and management decisions. 4 lectures. Prerequisite: MATH 118, GRC 421.

**GRC 437 Consumer Packaging (3)**

Problem-solving strategies for package printing which integrate concepts from management, design and technology. Package manufacturing, function, quality, visual appeal, and economics are addressed. Consumer packaging industry. 2 lectures, 1 activity. Prerequisite: GRC 137 or junior standing.

**GRC 439 Advanced Line and Halftone Media (4)**

Complex and experimental copy and art preparation and their limitations for use in line and halftone reproduction by gravure and offset lithography. Mechanical requirements; production procedures. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 336, GRC 417.

**GRC 440 Advanced Copy Technology (4)**

Complex copy preparation in line, tone and color for reproduction by flexography and letterpress (relief) printing; print production requirements for highspeed reproduction presses. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: GRC 439.

**GRC 460 Research Methods in Graphic Communication (1)**

Introduction to research methods for preparing scholarly and defensible papers and senior projects, and in conducting qualitative and quantitative evaluations, testing, and research in graphic communication. Methods covered include statistical, historical, descriptive, questionnaires, interviewing, and sampling. 2 seminars. Prerequisite: Senior standing and STAT 211.

**GRC 461 Senior Project (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in formal report. Minimum 90 hours total time. Prerequisite: Senior standing.

**GRC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**GSB—GRADUATE STUDIES—BUSINESS****GSB 511 Financial Accounting (4)**

Financial accounting model and accounting systems concepts. Principles and concepts used in preparing published financial statements. Interrelationships among those statements. Analysis and interpretation of their content. 4 seminars.

**GSB 512 Foundations for Quantitative Analysis (4)**

Basic quantitative concepts used in the MBA program: matrices, linear systems of equations, introduction to calculus, probability, basic statistical concepts and regression. Use of the computer for solution of problems in these areas is an integral part of the course. 4 seminars.

**GSB 513 Organizations and Management (4)**

Examination of major theories and conceptual constructs relating to the operating requirements of complex organizations, including manufacturing, service, and nonprofit organizations; historical development of theory and practice; managerial behavior functions and processes. Current issues and actual cases. 4 seminars.

**GSB 514 Legal Aspects of Management and the Market System (4)**

Managerial approach to important legal issues affecting business and the market system. Focus on those aspects of law which affect managers directly including contracts, products liability and corporations in perspective; principles of partnership authority, liability, and control; managerial duty and liability to the corporation; public control of managerial activity. 4 seminars.

**GSB 521 Accounting for Management Planning and Control (4)**

Managerial accounting with emphasis on communication and information to assist management in planning and control. Development of an operational understanding of cost systems, budgeting concepts, performance evaluation and other quantitative accounting techniques to assist management in planning and control. Accounting data in computer modeling applications. 3 seminars, 1 laboratory.

**GSB 522 Quantitative Business Analysis I (4)**

Concepts and techniques of quantitative methods in management planning. Mathematical programming. Optimization models of business enterprises utilizing Linear Programming and Quadratic Programming for decision-making and risk-return analysis. Goal Programming for alternate decision choices. Composite forecasting techniques utilizing objective and subjective criteria. Computer solutions. 4 seminars.

**GSB 523 Managerial Economics (4)**

Microeconomic analysis and its application to business decisions. Topics covered include market structures, pricing strategies, cost analysis and input selection. Examination of the economic impact of various governmental policies on the business firm. 4 seminars.

**GSB 524 Marketing Management (4)**

Introduction to marketing management. Concepts and principles necessary to plan, direct and control the product, promotion, distribution and pricing strategies of the firm. 4 seminars.

**GSB 531 Managerial Finance (4)**

Theories, practices and tools of financial decision making. Topics include financial statement analysis, financial forecasting, valuation, capital budgeting, capital structure, dividends, and an overview of financial markets and institutions. 4 seminars.

**GSB 532 Quantitative Business Analysis II (4)**

Concepts and techniques of quantitative methods relating to management planning and decision making. Focus on the analysis of decisions under uncertainty using methods of probability and statistics. Use of computer facilities as appropriate. 4 seminars.

**GSB 533 Aggregate Economic Analysis and Policy (4)**

Theoretical framework and empirical dimensions of the aggregate economic environment in which business enterprise must operate. Understanding of national income accounting, monetary and fiscal policies, inflation, unemployment and balance of payments issues in static and dynamic contexts. Develops an ability to understand macroeconomic events in an evolving and interconnected world economy. 3 seminars, 1 laboratory.

**GSB 534 Operations Management (4)**

Production function and its interaction with other functional areas in an organization. Application of quantitative and statistical methods to planning, control and decision making in operations management. Topics include economics of plant location, logistics, material management, and quality control. 4 seminars.

**GSB 541 Organizational Behavior (4)**

Examination of major psychological and sociological theories and conceptual constructs relating to behavior in modern organizations. Leadership styles, group dynamics, motivation, communication, perception, conflict resolution and attitude change as related to organizational effectiveness and performance. 4 seminars.

**GSB 542 Market Research and Planning (4)**

Makes the student a knowledgeable user of marketing research information to develop and implement marketing plans. Emphasis on development of ability for using research information to formulate marketing objectives and strategies and to analyze marketing problems in depth. 4 seminars.

**GSB 543 Information Systems for Decision Support (4)**

Overviews of management information systems and decision support systems. Impact of computers on society. Process of information systems development. File processing and integrated data base concept. Data communication and on line distributed systems. Management decision making using computer software packages. Report generation using word processing system. Interactive financial planning systems and the decision support systems. 3 seminars, 1 laboratory.

**GSB 551 Management in an International Environment (4)**

Impact of international factors on management. Organizational behavioral strategies in the context of differential economic, technological, political and cultural environments. 4 seminars.

**GSB 552 Financial Analysis and Planning (4)**

Application of financial theory and models to a variety of financial problems. Analysis and formulation of financial plans developed primarily through the use of cases and other real world examples. Working capital management, investment decision under conditions of risk, and financing and capital structure decisions. 3 seminars, 1 laboratory.

**GSB 561 Business, Government and Society (4)**

Analysis from social, economic, political, legal and ethical perspectives of the changing domestic and international environment within which the American business enterprise operates. 4 seminars.

**GSB 562 Business Strategy and Policy (4)**

Integration of total organization imperatives. Case studies and analysis of problems faced by top management. Strategy and policy formulation as affected by environmental factors, competition, technological development, growth objectives and organizational capabilities. Appraisal of total performance and alternative strategies. 4 seminars.

**GSB 570 Entrepreneurship and Small Business Management (4)**

Exploration in entrepreneurship with emphasis on the formation and management of new business ventures. Analysis of typical operating problems of these firms and application of appropriate techniques for their solution. 4 seminars.

**GSB 571 Seminar in Complex Organizations (4)**

Systems approach to understanding total organizational effectiveness. Structural, economic, political and behavioral analysis of organizations. Research and investigation of special problems to develop better understanding of how complex organizations function. 4 seminars.

**GSB 574 Seminar in Labor Relations (4)**

Labor relations and collective bargaining in the public and private sector. Relationships between unions, organizations and the government and an understanding of the causes of conflict and ways to resolve it. Emphasis on current practices, procedures and laws. 4 seminars.

**GSB 576 Organizational Analysis, Planning and Decision Making (4)**

Organizational strategy analysis and constructs; environmental, technological and behavioral factors influencing organizational objectives, structures and design; strategic and tactical planning concepts and decision making criteria relating to business, governmental and nonprofit organizations. 4 seminars.

**GSB 577 Quantitative Business Analysis III (4)**

Case studies using the concepts of Quantitative Business Analysis I and II applied to selected problems in business and industry. These involve concepts of linear programming, quadratic programming, goal programming and advanced forecasting concepts. Solutions of these models obtained using the resident computer system. 4 seminars.

**GSB 578 Operations Planning and Control (4)**

Basic concepts of designing control systems for operating environments of many types. Forecasting, operations planning, inventory planning and control, operations scheduling and dispatching and progress control with special emphasis on the application of the computer and the potential of materials equipment planning. 4 seminars.

**GSB 580 Industrial Marketing (4)**

Marketing of business goods and services to other businesses, governmental agencies and social institutions by the manufacturer. Market analysis, sales forecasting, product strategy, effective use of sales force and industrial advertising media. 4 seminars.

**GSB 581 Marketing Management Seminar (4)**

Practice in the application of analytical tools and techniques to current and potential marketing problems. 4 seminars.

**GSB 585 Seminar in Investments (4)**

Stock, bond and options market. Emphasis on operations of markets, the efficient markets hypothesis and portfolio theory. Setting investment objectives and managing portfolios given efficient capital markets. 4 seminars.

**GSB 586 Financial Institutions and Markets (4)**

Structure of money and capital markets and the financial institutions that operate in these markets. Evaluation of contemporary thought on the evolving market and institutional arrangements. Emphasis on the management policies of the institution. 4 seminars.

**GSB 589 Accounting Policy (4)**

Role of management in establishing and directing accounting policy. Coverage includes the impact of management decisions on external reporting and taxes and the establishment and maintenance of appropriate internal systems for planning, reporting and control. 4 seminars.

**GSB 591 Industry Analysis (4)**

In-depth study of major industry using analytical tools developed in prerequisite courses. Intensive investigation of the dynamic environment, markets, technology, financial and economic structures, history and other key factors. Further prospects for the industry explored through preparation of a comprehensive forecast. 4 seminars.

**GSB 594 Future of Business (4)**

Examination of the techniques and conclusions of representative future studies by research institutions such as the Rand Corporation, Hudson Institute and The Club of Rome. Analysis of the implications of those conclusions for the operations and role of business in society. 4 seminars.

**GSB 595 Organizational Change and Development (4)**

Application of behavioral science to the improvement of organizational effectiveness. Personal growth and goal setting, interpersonal relationships, team development and intergroup conflicts. Design and use of action programs to accomplish organizational change and development. 4 seminars.

**GSB 596 Economic Forecasting (4)**

Applications to business planning of selected economic forecasting techniques. Classical time series analysis, Box-Jenkins (ARIMA) models, adaptive (Kalman) filtering models, leading indicators and input-output analysis. 3 seminars, 1 laboratory.

**GSB 597 Seminar in Selected Economic Problems (4)**

Selected problems analyzed at an advanced level in a particular field, such as international trade, public finance, urban, industrial organization or transportation. 4 seminars.

**GSB 598 Graduate Internship in Business (CR/NC) (2-8)**

To permit students to correlate experience and academic knowledge. Placement in a supervised work program in a business or public organization as approved by the MBA Director. Sixty hours of work experience per two units of credit. Total credit limited to 8 units. Credit/No Credit grading only. Prerequisite: Second-year MBA students only.

**GSB 599 Individual Research (1-4)**

Advanced individual research planned and completed under the direction of a member of the school faculty. Designed to meet the needs of qualified students who wish to pursue investigations which they cannot follow effectively in regularly offered elective courses.

## HD—HUMAN DEVELOPMENT

**HD 101 Orientation to Psychology and Human Development (1) (CR/NC)**

Introduction to curricula and programs designed to prepare students for careers in psychology, child and adult development, early childhood education, and family studies. Credit/No Credit grading only. 1 lecture.

**HD 103 Pairing and Marriage (3)**

Functional approach to contemporary dating and pairing patterns with emphasis on developing communication during the early developmental stages of the paired relationship. 3 lectures.

**HD 108 Introduction to Human Development (3)**

Introduction to the developmental aspects of physical, mental, social, and emotional behavior across the life span. 3 lectures.

**HD 109 Parenting (2)**

Philosophies and techniques explored out of which an individual can devise an effective parenting style. Basic skills for parent effectiveness. 2 lectures.

**HD 130 Beginning Study of Human and Family Development (3)**

Introductory faculty-supervised experience with young children in an on-campus laboratory program. Participant observation and interaction with children, teachers, peers, and parents. Experience is determined by the student's option. By arrangement. Prerequisite: HD 101.

**HD 200 Special Problems for Undergraduates (1-3)**

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

**HD 203 Family Development (3)**

Survey of family living at each stage of the life cycle. Emphasis on developmental approach to understanding families, family subsystems, and family developmental tasks, socio-economic and cultural influences, and family differences. 3 lectures.

**HD 229 Program Planning for Young Children (2)**

Curriculum development and analysis of programs for young children with emphasis on activities, environment and communication. 2 two-hour activities. Prerequisite: HD 108, HD 130, PSY 201 or PSY 202. Concurrent enrollment in HD 230 and HD 231.

**HD 230 Intermediate Study of Human and Family Development (3)**

Faculty supervised, on-campus laboratory experience. Physical, emotional, social, cognitive, and language development studied. Laboratory experience is determined by the student's option. By arrangement. Prerequisite: HD 108, HD 130, PSY 201 or PSY 202. Concurrent enrollment in HD 229 and HD 231.

**HD 231 Seminar in Study of Human and Family Development (1)**

Seminar concurrent with faculty supervised, on-campus laboratory experience. 1 seminar. Prerequisite: HD 108, HD 130 and PSY 201 or PSY 202. Concurrent enrollment in HD 229 and HD 230.

**HD 296 Infant and Toddler Development (3)**

Development and behavior from conception to age three. Characteristic social, physical and sensorimotor behavior patterns of infants and toddlers in relation to the environment. 3 lectures. Prerequisite: HD 108, PSY 201 or PSY 202.

**HD 298 Preschool and Middle Childhood Development (3)**

Development and behavior of children from age three through age ten. Intellectual, physical, emotional, social, and moral development of the growing child. 3 lectures. Prerequisite: HD 296 or consent of instructor.

**HD 303 Family Interaction (3)**

Examination of the various processes of family interaction that result in the dynamic quality of family life. 3 lectures. Prerequisite: HD 203 and junior level standing.

**HD 306 Adolescence (3)**

Analysis of the years from prepubescence to young adulthood. Current research on individual development and behavior including interaction patterns with peers, family, and others. Multidisciplinary perspective on the interaction among physical, affective, cognitive, social and historical aspects of the youth culture. 3 lectures. Prerequisite: HD 108, PSY 201 or PSY 202 or consent of instructor.

**HD 308 Adulthood and Aging (3)**

Analysis of the stages of adulthood. Current research on adulthood and the aging process including interaction patterns with the family, peers, and others, as well as interrelations among physical, cognitive, and social development of the individual. 3 lectures. Prerequisite: HD 306 or consent of instructor.



**HD 323 The Helping Relationship (3)**

Basic skills and approaches common to helping relationships with children, adults, and families. Examines theoretical, empirical, and practical applications of helping. Differentiation between professional, paraprofessional, and nonprofessional helping relationships. 1 lecture, 2 laboratories. Prerequisite: HD 230, PSY 307 or consent of instructor.

**HD 329 Research Methods in Psychology and Human Development (3)**

Introduction to research methods and critical analysis in psychology, child and family studies. Topics will include experimental and nonexperimental research methods, statistical design and analysis as applied to a broad range of research areas. 3 lectures. Prerequisite: PSY 201 or PSY 202, Junior standing or consent of instructor. Recommended: STAT 211 or equivalent.

**HD 330 Supervised Internship (6)**

Faculty-supervised internship in a career-related setting for early childhood education students. Role of professional apprentice is experienced and analyzed by each student. Prerequisite: HD 230, HD 323, PE 280, junior standing and consent of instructor.

**HD 400 Special Problems for Advanced Undergraduates (1-3)**

Supervised investigation, including a written report, of a topic chosen with prior approval of instructor. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

**HD 401 Foundations of Child Development (3)**

Past, present and future perspectives in theory and research on child development and on programs for young children. 3 seminars. Prerequisite: HD 330 or consent of instructor.

**HD 404 Administration of Child Development Centers (3)**

Organization and administration of programs for young children, preschool and child care centers. Staffing, finance, equipment, records, program evaluations, regulations, public policy and community relations. 3 lectures. Prerequisite: HD 330, HD 401.

**HD 413 Parent-Child Relationships (3)**

Application of major theories to understanding of parent-child relations. Review of current research and evaluation of literature on parent-child interactions. 3 lectures. Prerequisite: HD 203, HD 298 or consent of instructor.

**HD 421 Developmental Processes (3)**

Critical examination of developmental processes in the three major domains of development: psychomotor-physiological, social-affective, and cognitive. Particular attention to the identification, assessment and relevance of specific processes, and to factors that influence and facilitate their development. Class schedule will list topic selected. Total credit limited to 9 units. 3 seminars. Prerequisite: HD 230, HD 306 or graduate standing and consent of instructor.

**HD 430 Advanced Internship (6)**

Faculty-supervised preprofessional experience in a career-related setting which complements the HD 330 internship. Such roles as master teacher, caseworker, therapeutic intern, administrative aide or program specialist are experienced and analyzed by each student. Prerequisite: HD 329, HD 330, HD 401, HD 421 and consent of instructor. 6 units required for Early Childhood Education students. Total credit limited to 12 units.

**HD 450 Family Therapy (3)**

Basic elements of marriage and family therapy. Emphasis on concepts, goals, and techniques of various family therapy approaches. 3 lectures. Prerequisite: Upper division or graduate standing or consent of instructor.

**HD 451 Family Crises (3)**

Analysis of causes and effects of crises on the family. Methods for prediction, control, and solution of family crises. 3 seminars. Prerequisite: HD 203, PSY 201 or PSY 202, upper division or graduate standing or consent of instructor.

**HD 453, 454, 455 Supervised Field Work (6) (6) (6) (Also listed as PSY 453, PSY 454, PSY 455)**

Supervised field work experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by the participating institution, supervising faculty member, and the student. Maximum of 6 units per quarter. Prerequisite: HD 230, HD 323, junior standing and consent of instructor.

**HD 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Project must be related to psychology, human or family development fields. Results of the project must be presented in a formal, written report. Minimum of 150 hours total time. Prerequisite: HD 329, HD 330 or HD/PSY 453 and consent of instructor.

**HD 463 Undergraduate Seminar (2)**

Exploration of career and graduate school options in psychology, human development and family studies. Definition of personal goals, career and life planning. Topical issues are addressed. 2 seminars. Prerequisite: Senior standing.

**HD 464 Issues in Family Life Education (3)**

Examination of the role of family life specialists in relation to the teaching profession, public agencies, and the community. Analysis of issues that impact on the family life educator. 3 lectures. Prerequisite: HD 453, HD 454.

**HD 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**HD 481 Family Theory (3)**

Critical analysis and discussion of the current theories used to explain family behavior including their application in the helping professions and family research. 3 seminars. Prerequisite: Senior standing.

## HE—HOME ECONOMICS

**HE 101 Home Economics as a Profession (2) (CR/NC)**

Exploration of professional opportunities available in home economics; advantages, disadvantages and the personal and professional qualifications required. Credit/No Credit grading only. 2 lectures.

**HE 121 Fundamentals of Food (4) (Also listed as DFA 121)**

Theoretical aspects and practical applications of the principles of food science and food preparation. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 three-hour laboratory. Prerequisite: CHEM 121.

**HE 122 Design Analysis (3)**

Design elements and principles as they apply to specific areas of home economics: interior design, textiles and clothing, and food presentation. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 two-hour laboratory.

**HE 131 Apparel Construction (3)**

Basic techniques in apparel construction. Emphasis on pattern and fabric selection, fit, and quality construction. 1 lecture, 2 three-hour laboratories.

**HE 200 Special Problems for Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Consent of department head.

**HE 203 Consumer Role of the Family (3)**

The individual and family as consumers in the marketplace. Sources of consumer protection and recourse. Influence of selected management concepts on consumption patterns. 3 lectures.

**HE 207 Problems of Family Housing (3)**

Analysis of the changing processes of producing, purchasing and regulating family housing. Emphasis on consumer housing problems. 3 lectures. Prerequisite: Sophomore standing, one course in sociology and one course in economics recommended.

**HE 210 Nutrition (3) (Also listed as DFA 210)****GEB E.2.**

Nutrition as it relates to health throughout the life cycle, with emphasis on the young adult. 3 lectures.

**HE 220 Contemporary Textile Products (3)**

Trends, selection, use and care of textile end-products: carpets, draperies, upholstery, other interior textiles, and apparel. Legislation as it affects consumers and the industry; resources for current information. 3 lectures.

**HE 224 Creative Textiles (3)**

Exploration and development of a variety of creative textile projects through demonstrations and laboratory experiences. Course content will vary each quarter. Total credit limited to 6 units. Miscellaneous course fee required—see *Class Schedule*. 3 three-hour laboratories. Prerequisite: HE 122 or consent of instructor.

**HE 226 Methods of Home Food Preservation (2)**

Preservation techniques to obtain maximum food quality. Emphasis on palatability, appearance, safety, and efficient use of resources. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 two-hour laboratory. Prerequisite: HE 121.

**HE 237 Clothing and the Individual (3)**

Apparel for individuals in various stages of the life cycle. Emphasis on selection, design, and construction of garments to meet developmental, psychological, and economic needs. Traditional and nontraditional sources of apparel. 3 lectures.

**HE 241 Flat Pattern (3)**

Principles of designing by drafting and flat pattern methods. Development of production patterns for selected designs. Advanced fitting techniques. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 three-hour laboratories. Prerequisite: HE 122 and HE 131 or consent of instructor.

**HE 242 Interior Design (4)**

Basic interior design: visual, functional, and economic aspects of planning interior space. Laboratory experience in solving realistic design problems. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 two-hour laboratory. Prerequisite: HE 122 or consent of instructor.

**HE 309 History of Interior Design (3)**

Development of furniture styles and their environments through the Nineteenth century. 3 lectures. Prerequisite: Junior standing.

**HE 310 Maternal and Child Nutrition (3) (Also listed as DFA 310)**

Nutritional requirements from conception to adolescence; role of nutrition in normal development. 3 lectures. Prerequisite: HE 210.

**HE 311 History of Interior Design Laboratory (2)**

Application of historical interior backgrounds and furnishings in contemporary residential design. Miscellaneous course fee required—see *Class Schedule*. 2 three-hour laboratories. Prerequisite or concurrent: HE 309.

**HE 315 Textiles and Clothing Industries (3)**

Commercial aspects of design, production, and distribution of textiles and clothing. External influences which affect the fashion industry. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HE 321 Meal Management (3) (Also listed as DFA 321)**

Factors and principles involved in the choice, purchase, and preparation of foods for a meal. Application of management principles in the use of time, energy and money in relation to feeding the family. Planning, preparing, and serving of meals with emphasis on nutritional, aesthetic, economic, and cultural aspects of food. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 two-hour laboratories. Prerequisite: HE 121, HE 122, HE 210, or consent of instructor.

**HE 322 Textiles (3)**

Physical and chemical characteristics of natural and synthetic fibers. Laboratory application of theory in understanding properties of fibers, yarns, fabrics, and finishes as related to the selection, use and care of textiles. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 three-hour laboratory. Prerequisite: CHEM 122, HE 220 or consent of instructor.

**HE 323 Individual Residential Design (4)**

Developmental and sequencing processes for single-family residences as they relate to the professional practice of interior design. Emphasis on items frequently specified by interior designers and on working drawings. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 three-hour laboratories. Prerequisite: HD 203, HE 207, HE 331, HE 344 or consent of instructor.

**HE 324 Management of Family Resources (3)**

Application of ecosystem framework as related to contemporary aspects of family and group living management. Analysis of selected resource management areas. 3 lectures. Prerequisite: HE 203, or consent of instructor.

**HE 326 Demonstration Techniques (3)**

Development of effective means of communication by use of the demonstration technique, through presentations with evaluations. 3 two-hour laboratories. Prerequisite: SPC 201, HE 331 or consent of instructor.

**HE 331 Household Equipment (4)**

Principles involved in construction, operation, energy consumption, selection, safety, and space utilization of household equipment. 3 lectures, 1 two-hour laboratory. Prerequisite: Junior standing.

**HE 333 Apparel Design by Draping (3)**

Draping fundamentals as one element of the apparel design production process. Designing for the individual and the fabric. Miscellaneous course fee required—see *Class Schedule*. 3 two-hour laboratories. Prerequisite: HE 241 or consent of instructor.

**HE 334 Special Fabrics (3)**

Interrelationships of appropriate designs, equipment, and construction techniques to special fabrics. Care and storage of apparel constructed from special fabrics. Evaluation of ready-to-wear. Miscellaneous course fee required—see *Class Schedule*. 3 lectures. Prerequisite: HE 131, HE 322.

**HE 341 Clothing and Human Behavior (3)**

Socio-cultural, psychological, economic and aesthetic aspects of clothing as related to human behavior. 3 lectures. Prerequisite: One course in psychology, SOC 105.

**HE 344 Interior Design Materials and Techniques (3)**

Survey of materials used for interior surfaces. Practical experiences in specification writing and custom design. Basic interior design business procedures. Total credit limited to 6 units. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 three-hour laboratories. Prerequisite: HE 220, HE 242, or consent of instructor.

**HE 400 Special Problems for Advanced Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Senior standing and consent of department head.

**HE 401 Occupational Training Seminar (3)**

Current developments in the teaching of vocational, home economics-related occupations at the secondary level. 3 seminars. Prerequisite: Senior standing or consent of instructor.

**HE 404 Seminar in Financial Responsibilities of the Family (3)**

Individual and group study of the economic role of the family: factors affecting use of income; cost of goods and services within the U.S. economic system. Opportunity to analyze and make decisions concerning families' financial situations and understand how their specific socio-economic levels relate to other families. 3 seminars. Prerequisite: HE 324 or consent of instructor.

**HE 407 Seminar in Family Housing Trends (3)**

Housing industry trends in construction and mass marketing as they affect the practice of professional residential interior design. 3 seminars. Prerequisite: HE 207 or consent of instructor.

**HE 411 Teaching Methods in Home Economics (3)**

Selection of valid content and learning activities for a variety of teaching situations and strategies in the classroom, community, or clinic setting. 2 lectures, 1 laboratory. Prerequisite: ED 305 or consent of instructor.

**HE 412 Home Economics Student Teaching Seminar (3)**

Practices and problems of student teaching in home economics. Synthesis of professional study and experience to develop teaching competence. Taken concurrently with student teaching. 3 seminars.

**HE 415 Methods of Teaching Nutrition (3) (Also listed as DFA 415)**

Selection of valid content and learning activities for a variety of teaching situations and strategies in the classroom, community, or clinic setting. Writing of measurable objectives and the utilization of appropriate motivational and evaluation techniques. Activity designed to prepare students to teach nutrition at all stages of the life cycle. 2 lectures, 1 two-hour activity. Prerequisite: DFA 328, ED 305, and senior standing.

**HE 420 Fashion Merchandising (3)**

Planning, buying, and selling of fashion merchandise through various distribution channels. Retailer development, organization, operations, and image. Promotion, advertising, and visual display. 3 lectures. Prerequisite: HE 122, HE 203, HE 315, ECON 201, MKTG 204 and MKTG 301 or MKTG 302 suggested.

**HE 421 Cultural and Aesthetic Aspects of Food (3) (Also listed as DFA 421)**

Psychological, sociological and economic factors that influence the formation of food habits and attitudes. Lab illustrates application of basic principles of food science to food consumption patterns of cultural groups. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 three-hour laboratory. Prerequisite: HE 321 or consent of instructor.

**HE 423 Clothing for Disabled People (3)**

Analysis and discussion of designs and functions of clothing as related to special needs of people with physical differences. 3 seminars. Prerequisite: HE 241, HE 322 or consent of instructor.

**HE 430 Advanced Textiles (2)**

Seminar in advanced textiles including fiber structure, fabrics, and finishes as related to textile performance. Review and reporting of student independent investigations. 2 seminars. Prerequisite: HE 322.

**HE 431 Advanced Textiles Laboratory (1)**

Advanced study of fiber structure, fabrics and finishes through laboratory experimentation. Individual and group research on fabric performance. Taken concurrently with HE 430. Miscellaneous course fee required—see *Class Schedule*. 1 three-hour laboratory. Prerequisite: HE 322.

**HE 432 Advanced Interior Design (3)**

Individual research and creative experiences in interior design. Total credit limited to 9 units. Miscellaneous course fee required—see *Class Schedule*. 3 three-hour laboratories. Prerequisite: HE 311, HE 323, EDES 112 or consent of instructor.

**HE 433 Historic Costume (3)**

Chronological study of costume designs as related to cultural influences. 3 lectures.

**HE 435 Seminar in Trends and Developments in Interior Design (3)**

Trends and developments in interior design. Examination of the social and economic factors affecting major twentieth century furniture and fabric designers. Emphasis on professional use of trade source centers. Individual research. 3 seminars. Prerequisite: HE 344, senior standing or consent of instructor.

**HE 440 Internship (1-12) (CR/NC)**

Career experience with private or public agencies. Total credit limited to 12 units. Credit/No Credit grading. Prerequisite: Junior standing and consent of department head.

**HE 442 Comparative Tailoring (3)**

Traditional and contemporary tailoring techniques. Garment construction and selection. Investigation of and reporting on tailoring types, methods, fabrics, and garment qualities. 1 seminar, 2 three-hour laboratories. Prerequisite: HE 241, HE 322 or consent of instructor.

**HE 461, 462 Senior Project (3) (3)**

Selection and completion of research related to the student's area of interest. Project requires a formal report which must follow department guidelines. Minimum of 180 hours required. Prerequisite: ENGL 215 or ENGL 218 and completion of 135 quarter units including all freshman, sophomore, and junior classes in the area of study.

**HE 463 Undergraduate Seminar (2) (CR/NC)**

Discussion of individual capabilities, values, academic preparation as they relate to the career process; implications of current social issues for the profession. Recommended enrollment three quarters prior to graduation. 2 seminars. Credit/No Credit grading only. Prerequisite: Senior standing in major.

**HE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. Miscellaneous course fee may be required—see *Class Schedule*. 1 to 3 lectures. Prerequisite: Consent of instructor.

**HE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topics selected. Total credit limited to 6 units. 1 to 3 three-hour laboratories. Prerequisite: Consent of instructor.

**HE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head, graduate program coordinator, and supervising faculty member.

**HE 511 Research Design (3)**

Methods of research and critical analysis of scientific literature and problems in home economics. 3 seminars. Prerequisite: Graduate standing.

**HE 525 Experimental Studies in Textiles (3)**

Review and reporting of current developments in textiles; study and analysis of pertinent literature. Application through laboratory testing; individual and group research. 2 seminars, 1 three-hour laboratory. Prerequisite: Graduate standing and HE 430, HE 431 or consent of instructor.

**HE 528 Experimental Studies in Foods (2)**

Experimental approach to the study of chemical and physical properties of interacting components of selected foods; correlated emphasis on selection, application, and evaluation of pertinent literature. 1 seminar, 1 two-hour laboratory. Total credit limited to 4 units. Prerequisite: Graduate standing or consent of instructor.

**HE 536 Experimental Studies in Household Equipment (3)**

Development of professional and consumer criteria to improve evaluation of household appliances. Current research and techniques for investigations with home equipment. 2 seminars, 1 three-hour laboratory. Prerequisite: Graduate standing and HE 331 or consent of instructor.

**HE 580 Seminar (1-3)**

Advanced study of current issues and topics significant for professional home economists. Class schedule will list topics selected. 1-3 seminars. Prerequisite: Graduate standing.

**HE 599 Thesis (3) (3)**

Individual research under the general supervision of the staff, leading to a graduate thesis of suitable quality. Only 6 units may be applied to degree requirements. Students must enroll every quarter in which advisement is received. Prerequisite: Graduate standing.

**HIST—HISTORY****HIST 101, 102, 103 History of Western Civilization (3) (3) (3)**

Development of western civilization from earliest times to the present. Political, economic, social, intellectual, and religious contributions of the various peoples to contemporary life. 3 lectures.

**HIST 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**HIST 201, 202, 203 United States History (3) (3) (3)****GEB D.1.**

Comprehensive survey of the development of the United States from the 15th century to the present. HIST 201 satisfies the general education requirement of HIST 204 for History majors. 3 lectures.

**HIST 204 History of American Ideals and Institutions (3)****GEB D.1.**

Comprehensive thematic study of the historical development of industry, corporations, racial relations, foreign policy and political and constitutional issues since the foundation of the Republic. Such an historical analysis will enable students to better understand contemporary America. Not open to students with credit in HIST 201, HIST 202, HIST 203. 3 lectures.

**HIST 205 The United States in World Affairs (3)**

Origin, nature, and implementation of U.S. foreign policy since the Second World War. Domestic and international factors relating to U.S. objectives; discussion and analysis of major issues and problems of contemporary U.S. foreign policy. 3 lectures.

**HIST 221 Historical Craft (3)**

Introduction to research and writing methods in history; seminar approach to the craft of history. Topics: nature of historical research, research methods, library facilities, basic bibliography and organization skills, writing techniques. 3 seminars.

**HIST 222 Writing and Research Seminar in History (3)**

Development of research and bibliographic skills in the process of composing a major research paper. Emphasis will be upon thesis formation, the development of the synoptic skills of historical analysis and the preparation of written and oral critiques of the papers presented in the seminar. 3 seminars. Prerequisite: HIST 221, ENGL 114, and ENGL 125 or PHIL 125 or SPC 125.

**HIST 270 History through Film (3)**

Various historical themes examined through the medium of film. Influence and overall relationship of films to the societies that produced them examined. May be repeated to 6 units. 2 lectures, 1 laboratory.

**HIST 285 Vietnam War at Home and Abroad (3)**

Role of U.S. foreign policy in the transformation of the Vietnamese revolution from a colonial insurrection into a multinational conflict. Interaction of public opinion, electoral politics with foreign policy formulation and military strategy analyzed. 3 lectures.

**HIST 301 Historiography (3)**

Theory, interpretation and philosophies of history. 3 seminars. Prerequisite: HIST 221 and junior standing.

**HIST 305 History of American Agriculture (3)**

Agricultural development with emphasis upon economic, political and social implications. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 306 History of American Technology (3)**

Development of industrial, transportation, and agricultural technologies in America. Miscellaneous course fee required—see *Class Schedule*. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 307 History of Science (3)**

Historical impact of science on human and physical environments from ancient to modern times. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 308 American Warfare (3)**

Inception, induction and impact of American warfare from 1775 to the present within the context of changing ideas and major political, social and economic developments. 3 lectures. Prerequisite: Junior standing.

**HIST 311 Early Britain (3)**

History of the British Isles from the reconstruction of Celtic history to the end of the Medieval epoch. 3 lectures.

**HIST 312 Early Modern Britain (3)**

History of the British Isles from the end of the Medieval epoch to the era of the American revolution—from Richard III to George III. 3 lectures.

**HIST 313 Modern Britain: Industry, Empire and War (3)**

History of the British Isles from the loss of the American colonies through the era of the World Wars and the dissolution of the British Empire. 3 lectures.

**HIST 314 The Middle East (3)**

Islamic civilization, the Ottoman Empire, origins of Pan-Islamism, Arab, Turkish, Iranian nationalism, impact of World Wars I and II, and the background of contemporary problems. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 315 Modern World History (3)****GEB D.2.**

Analysis of the interaction of selected traditional and modernizing non-Western cultures with Western industrial imperialism and its attendant forces. Within this context, evaluation of both the nature of industrial imperialism and the way in which it influenced or interfered with the host culture. 3 lectures.

**HIST 325 Comparative History of American Minorities (3)**

Analyzes the political, economic and social status of various racial and ethnic groups in the United States, focusing on the history of Asians, Blacks, Chicanos and Native Americans, emphasizing both the general and particular forces that influenced their experience in America and the varying degrees to which each was able to maintain its cultural identity. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 328 American Indian History (3)**

Historical examination of Native American culture; topics of conflict and contributions emphasized. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 329 American Indian Thought (3)**

Cultural, spiritual, and philosophical concepts of several Native American societies; the intellectual and religious influences of Indians upon American society; their adaptation to White domination. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 331 Afro-American History (3)**

Political and social history of Afro-Americans from the early 17th century to the present; emphasizes the Afro-American contribution to American cultural and political life. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 339 Latin American History (3)**

Political, social, economic and cultural history of Latin America. Class Schedule will list topics selected.



**HIST 343 Greece and Rome (3)**

Foundations of western civilization; origins and development of the science, technology, philosophy, religion, art, and sociopolitical institutions which produced the modern world; continuity between ancient times and the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 346 Medieval Europe (3)**

Medieval society from the emergence of feudalism to the beginning of the Renaissance: triumph of the papacy; development of feudal monarchies and institutions; the crusades; recovery of commerce; rediscovery of Greek thought, and rise of universities. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 347 Renaissance and Reformation (3)**

Decline of medieval universalism; rise of commercial capitalism and dynastic nation-states; flowering of the Renaissance; Protestant reformation. Economic, political, social, intellectual, and cultural influences. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 348 Religious Wars and Absolutism (3)**

Era of the Counter-Reformation and Divine Right absolutism, religious and dynastic wars and their impact on the political, economic, social, religious and cultural fabric of European civilization. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 349 The Age of Revolution and Napoleon (3)**

Europe from the death of Louis XIV (1715) to the settlement at Vienna of 1815. International rivalries, continental and global warfare, the philosophy of the Enlightenment, Enlightened Despotism, the French Revolution, and Napoleon. Political, intellectual, economic, and social developments and upheavals during the eighteenth century. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 351 Europe in the Age of Reaction and Revolution, 1815-1871 (3)**

Reaction to the French Revolution; industrialization, the liberal socialist and nationalist revolts against the conservative order of 1815. 3 lectures.

**HIST 352 Europe in the Age of Imperialism and War, 1871-1919 (3)**

Maturation of industrialization, socialism and nationalism; the imperialist competition of nation states for world hegemony and the explosion of the First World War: 3 lectures.

**HIST 353 Europe in the Age of Fascism (3)**

Democracy in crisis and the fascist alternatives. Second World War and the recovery of Europe in a bipolar world. 3 lectures.

**HIST 375 Urban History of America (3)**

Growth and development of American cities from the Colonial period through the 1970s. Includes a comparative analysis of American urban areas with city development in Europe, Asia and Africa. Special emphasis on the evolution of urban culture, assimilation of European ethnic groups, clash of city and rural values, rise of racial ghettos. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 381, 382 African History (3) (3)**

Survey of African history from earliest times; ancient African civilizations, Moslem penetration, indigenous kingdoms, European colonialism, rise of African nationalism, development of independent Africa as illustrated by the history of selected countries. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 383 History of American Thought (3)**

Thought and culture in America since the Puritans. 3 lectures.

**HIST 384 Labor and Work in American History (3)**

Labor and work from the colonial period to the present. Analysis of the organization and division of the labor process, formation of classes, rise of unions and the shift from an industrial to a service and high technology workforce. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 385 Topics in California History (3)**

In-depth analysis of selected political, economic, and social issues involved in the development of California from the earliest times to the present. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 386 Frontiers in American History (3)**

Development and evolution of the frontier experience in chronological and geographic context. Consideration given to the various political, economic, social, cultural and religious factors which helped to bring about the end of the so-called frontier. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 387 From Colony to Empire: A History of U.S. Foreign Relations (3)**

Analysis of the evolution of this culture from an insecure appendage of European colonialism to a global power implementing a foreign policy based on hegemonic assumptions. Analysis of the impact of internal developments on foreign relations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**HIST 401 Colonial America (3)**

Age of exploration; European powers in eastern North America; English settlements; development of the English colonies, with emphasis on Virginia and Massachusetts; proprietary interests; growth of internal control, and colonial conflicts. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 402 American Revolution (3)**

Background of the Anglo-American imperial problem; the War for Independence and internal democratic upheaval of the era; establishment of the new nation, origins of the Constitution, the party system, American foreign policy, the national economy. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 403 Jacksonian America (3)**

Growing nationalism and simultaneous development of sectional rivalries; emerging two-party system; the transportation revolution; early industrialization; and a changing social order. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 404 Civil War and Reconstruction (3)**

Interaction of political, social and economic forces with personalities and ideas in a period in which the political process failed to function. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 405 Rise of Industrial America (3)**

Interaction between rising industrialism and traditional agrarian democracy. Relationship between the industrial system and the values of democratic institutions. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 406 Progressive Era (3)**

Economic, social, intellectual, and political history, and foreign policy. Progressive response to problems of industrialization, agriculture, and urbanization; development of the American corporate business system; era of normalcy and onset of the depression. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 407 Modern America (3)**

Major developments of the mid-twentieth century. Change and growth in domestic and foreign policies; the Depression, New Deal, World War II, Cold War. Problems of world leadership and contemporary domestic problems. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 415 East Asian Civilization (3)**

Central ideas and institutions which have shaped Chinese, Japanese and Korean civilization since ancient times. Emphasis on cultural themes rather than a political continuum. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 416 Modern Japan (3)**

Japan's development as a modern state in the 19th and 20th centuries. Emphasized themes include the conflict of modernity and cultural continuity, the persistence of traditional values and postwar reconstruction of Japanese society. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 417 Modern China (3)**

Analysis of Chinese history in the twentieth century, the conflict between modernity and cultural continuity. Chinese Communist Party and People's Republic of China since 1949. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 423 History in the Elementary School (3)**

Selected history topics taught in grades 4-6 in California, including ethnic Americans, third world cultures and the interdisciplinary historical method. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 424 Organizing and Teaching History (3)**

Organization, selection, presentation, application, and interpretation of subject matter in history in secondary schools. 3 seminars. Prerequisite: Admission to teacher education program or valid teaching credential.

**HIST 426 Tsarist Russia (3)**

Evolution of Russian autocratic society from the foundation of tsarist absolutism in the fifteenth century to 1917; reaction, reform and revolutionism. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 427 Soviet Russia (3)**

Transformation of Russian autocracy from tsarist to Bolshevik under the impact of World War I and the revolution of 1917; the formative force of Marxism-Leninism, forced collectivization and industrialization, the social engineering of the New Soviet Man; World War II, the Cold War and peaceful coexistence. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 429 History of Communism (3)**

Theory and practice of Marxian Communism since 1848. 3 lectures. Prerequisite: HIST 315 and junior standing or consent of instructor.

**HIST 435 Women in History (3)**

Traditional roles and attitudes about women; contributions of individual women; changing conditions and their implications for today's woman. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 437 Nazi Germany (3)**

Intellectual, social and cultural roots of National Socialist ideology and how they combined under the influence of Adolph Hitler to produce the Nazi Revolution. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 460 Senior Project (2)**

Selection and completion of a project under faculty supervision. Results presented in a formal report. Minimum of 60 hours time. Prerequisite: HIST 301.

**HIST 463 Undergraduate Seminar (2)**

Historical analysis of selected problems and topics for undergraduates. 2 seminars. Prerequisite: HIST 301.

**HIST 468 Internship in State and National Park History (3) (3)**

Work experience program in interpreting state and national park history. Weekly three-hour seminar and regularly scheduled work experience training at Hearst-San Simeon State Historical Monument. 90 hours of work experience per 3 units of credit. Miscellaneous course fee required—see *Class Schedule*. Recommended preparation: Western Civilization Survey, U.S. and California History, History of Art.

**HIST 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Junior standing or consent of instructor.

**HIST 590 Seminar in History (3)**

Historical analysis of selected problems and topics. Each seminar will carry a subtitle descriptive of its content. 3 seminars. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

**HUM—HUMANITIES****HUM 302 Human Values in Agriculture (3)**

Nature of values at issue in agriculture which impact on the wider community. Technical-factual foundation of needs of agriculture which contribute to value conflicts, discrimination between resolvable and unresolvable conflicts, ethical principles and devices yielding resolutions. Interdisciplinary team taught, with guest lecturers and possible field trips. Literary materials, novels, short stories, and expository history giving dramatic expression to values. 3 lectures.

**HUM 320 Future Studies (3)****GEB C.3.**

Evaluation of methods used in forecasting future trends. Critical examination of the projections made by futurists and their implications for humanity. 3 lectures. Prerequisite: One composition course or consent of instructor.

**HUM 350 Aesthetics (3)****GEB C.3.**

Cultivation of an intellectual and experiential basis for aesthetic values and judgment of artistic phenomena which includes the disciplines of philosophy, religion, history, fine arts, psychology and literature. 3 lectures. Prerequisite: English composition course or consent of instructor.

**HUM 400 Independent Study Project (1-2)**

Independent study project focusing more than one discipline on a problem in the Humanities. May involve travel and/or independent research. Bibliography and study plan submitted in advance. 1-2 activities. Prerequisite: Junior or senior standing and consent of instructor.

**HUM 402 Values and Technology (3)****GEB C.3.**

Humanistic investigation into the theoretical and practical applications of technology with specific reference to the social effects of technological change. For all majors. Nontechnical. Miscellaneous course fee required—see *Class Schedule*. 3 lectures. Prerequisite: Junior or senior standing.

**HUM 470 Selected Advanced Topics (2-4)**

Focused interdisciplinary study of a problem in the Humanities combining the insight and expertise of more than one discipline, such as history, literature, religious studies, philosophy, fine arts and the sciences. 2-4 lectures. Prerequisite: Consent of instructor.

**IE—INDUSTRIAL ENGINEERING****IE 101 Introduction to Industrial Engineering (2)**

Development of the industrial economy and the profession of industrial engineering. Concepts and principles of industrial organization and management. Survey of industrial engineering techniques and areas of application in manufacturing and service systems. Career opportunities review. 1 lecture, 1 laboratory.

**IE 121 Industrial Systems Analysis (2)**

Systems, subsystems, and relationships (interfaces) of industrial systems concepts in modern productive society. Trends in techniques for data gathering, analysis, and presentation for management decisions. 1 lecture, 1 laboratory.

**IE 131 Work Measurement and Design (3)**

Principles of work simplification, methods flow charting and micro-motion analysis. Quantitative analysis of work measurement methods including time study, synthetic data and work sampling. Review of allowances and performance ratings. Integration of these techniques in human-machine systems. 2 lectures, 1 laboratory. Prerequisite: MATH 141.

**IE 141 Manufacturing Processes (1)**

Metal casting as a process in manufacturing. Properties of molding materials and methods of casting. Sand, shell molding, investment molding and casting, core making, and sand testing. Pattern and casting design principles. Miscellaneous course fee required—see *Class Schedule*. 1 laboratory.

**IE 200 Special Problems for Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**IE 201 Production Costs Estimating (3)**

Estimating the costs of manufactured products and services on detailed estimates of labor, materials, overhead and general and administrative type expenses. Topics include break even points, price breaks, industrial learning, network cost analysis, multiple regression derived formulas, labor efficiency and cost indices. 3 lectures. Prerequisite: Sophomore standing.

**IE 214 Production Control (2)**

Coordination of production facilities to meet objectives of customer service, minimum inventory investment, and maximum manufacturing efficiency. Forecasting, statistical determination of order requirements, group technology concepts, input-scheduling and machine loading control techniques. Production systems computer modeling. 2 lectures. Prerequisite: Sophomore standing.

**IE 222 Engineering Analysis (3)**

Mathematical and statistical methods of evaluating variability of engineering design parameters, predicting deviations from expected averages, counting, grouping data for computations. Computer applications. Expected fit within engineering tolerances and allowable signal fluctuations. 2 lectures, 1 activity. Prerequisite: MATH 131.

**IE 233 Computer Aided Manufacturing (2)**

Introduction to CAD-CAM and CIM systems. Manual and computer programming systems for machining operations. Control tape verification by plotter techniques. NUMERIDEX, teletype and microprocessor systems for control tape generating operations. APTIV System utilized in computer program output control for manufacturing. 1 lecture, 1 laboratory. Prerequisite: ETME 142, ETMP 144.

**IE 239 Industrial Costs and Controls (4)**

Estimating of manufacturing costs for production planning, cost analysis, and cost control. Budgeting and use of cost and accounting data and analysis of cost variances for managerial control, inventory valuation, and pricing decisions. Techniques of forecasting, cost estimating, and cost reduction. 3 lectures, 1 laboratory. Prerequisite: IE 131.

**IE 240 Additional Engineering Laboratory (1–2)**

Total credit limited to 4 units, with not more than 2 units in any one quarter. 1 or 2 laboratories.

**IE 251 Manufacturing Engineering Laboratory (4)**

Properties of materials including relative cost selection for industrial use. Experimental studies in properties and behavior of metals, heat treatment, and metrology. State of art manufacturing methods in electronic devices and assembly. Instrumented analysis of cutting tool forces and machine tool alignment with laser interferometry. 2 lectures, 2 laboratories. Prerequisite: CHEM 124, MATH 142.

**IE 261 Problem Solving in Industrial Engineering (2)**

Introduction to problem solving techniques in industrial engineering, with primary emphasis on the solution of problems encountered in the profession. Programming and solution techniques using mainframes, mini- and microcomputers. 1 lecture, 1 laboratory. Prerequisites: MATH 143, IE 101, ENGR 251.

**IE 303 Project Management (2)**

Design, analysis and implementation of a major industrial/business systems problem. Emphasis on periodic impacting situations requiring resolutions and management decisions by groups representing various elements of an industrial company structure. 2 lectures. Prerequisite: IE 131.

**IE 304 Operations Research (3)**

Introductory study of matrix theory, linear programming by graphical and Simplex method, sensitivity analysis, transportation and assignment algorithms. Introduction to goal programming. Existing computer programs and algorithms utilized. 3 lectures. Prerequisite: MATH 242.

**IE 305 Operations Research II (4)**

Theory and applications of network analysis, queuing models, dynamic programming and inventory models, computer programming in solution of problems. 3 lectures, 1 laboratory. Prerequisite: IE 304, STAT 321.

**IE 312 Data Management and System Design (3)**

Design and management of industrial data bases and reporting systems. Topics include relationships to financial accounting and production control systems, efficient data entry routines, report formats, data base managers and system benefit cost analysis. 2 lectures, 1 laboratory. Prerequisite: ENGR 251.

**IE 314 Engineering Economics (3)**

Economic analysis of engineering decisions. Determining rates of return on investments. Effects of inflation, depreciation and income taxes. Application of basic principles and tools of analysis using case studies. 3 lectures. Prerequisite: ECON 201 or equivalent, junior standing.

**IE 316 Microprocessors as Control Devices (2)**

Survey of the use of control systems in the factory environment. Basic control theory including feedback and process synchronization. Projects consist of the programming and use of a variety of intelligent devices including programmable controllers, robotic arms, and industrial control systems. 1 lecture, 1 laboratory. Prerequisite: MATH 143, IE 233.

**IE 319 Human Factors Engineering I (3)**

Research into factors influencing the efficiency of human work. Data on the physical and mental capacities of persons, the physical environment, work organization, and the problem of aging. Human reactions and capabilities related to specific tasks and systems. Design of machines, operations, human computer interface and work environment to match human capacities and limitations, including the handicapped. 3 lectures. Prerequisite: PSY 202 and junior standing.

**IE 326 Engineering Test Design and Analysis (3)**

Design and statistical analysis of engineering experiments. Linear and nonlinear regression and analysis of variance techniques used in model building; testing of hypotheses for manufacturing decisions. Experimental methods for evaluation and comparison; interpretation of interference, fatigue and field data. 3 lectures. Prerequisite: STAT 321.

**IE 334 CAD/CAM (3)**

Identification and study of the individual techniques of CAD/CAM as being practiced in modern industry. 2 lectures, 1 laboratory. Prerequisite: IE 233, ETME 143, ENGR 251 or a course in a high level computer language.

**IE 343 Facilities Design (4)**

Utilization of manufacturing data in the design of production processes and planning industrial facilities. Quantitative analysis of integrated plant arrangement. Product flow, production line balancing, material handling, warehousing. Computerized methods and CADAM systems. Systems approach to optimum facilities design. 2 lectures, 2 laboratories. Prerequisite: IE 239, IE 305, IE 334.

**IE 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limit to 4 units, with a maximum of 2 units per quarter.

**IE 401 Sales Engineering (2)**

Concepts and principles of engineering in sales. Role of the professional engineer in the analysis, design, development, production, and final application of a product or system required by the buyer. 2 seminars. Prerequisite: Senior standing in engineering, or consent of instructor.

**IE 403 Principles of Engineering Economics (3)**

Development of methods to assess the time-value of money through mathematical models. Evaluating economic factors in the making of individual or industrial decisions. Effects of depreciation and income taxes on the analysis. 3 lectures. Prerequisite: Senior standing in other than engineering.

**IE 407 Algorithmic Systems Analysis (4)**

Advanced linear programming as applied to problems in industrial systems. Integer programming using branch-and-bound. Nonlinear programming. Quadratic programming. Dynamic programming concepts. Case studies of current topics in industrial engineering. 3 lectures, 1 laboratory. Prerequisite: MATH 242, IE 305.

**IE 409 Economic Decision Systems (3)**

Economic evaluation of information for sequential decision process; Bayes theory and models. Decision theory and value information applied to financial control. Cybernetics, information theory introduced. Major project justification procedures. 3 lectures. Prerequisite: IE 239, IE 305, IE 314.

**IE 410 Inventory Control Systems (4)**

Planning and inventory control systems required in manufacturing firms. Development of systems to assist in forecasting demand, scheduling orders, assigning workforce, controlling inventory and monitoring costs. 3 lectures, 1 laboratory. Prerequisite: IE 239, IE 261, IE 305.

**IE 411 Production Systems Analysis (3)**

Capacity requirements planning and load profile analysis. Job sequencing and machine loading through priority scheduling. Shop floor control and factory data collection methods. Group technology, parts coding and classification. Production flow analysis; cellular and flexible manufacturing systems. Assembly line balancing. Computer applications. 2 lectures, 1 laboratory. Prerequisite: IE 410.

**IE 413 Flexible Manufacturing Systems (3)**

Application of modern techniques related to production scheduling decisions. Shop floor control with emphasis on priority scheduling. Group technology and existing classification and coding systems. Cellular manufacturing and production flow analysis. Flexible manufacturing systems. Material resource planning. Computer applications. 3 lectures. Prerequisite or concurrent: IE 305, ENGR 251.

**IE 420 Simulation for Design Analysis (4)**

Design and analysis of manufacturing and service systems by simulation. Basic concepts of simulation type models, functions of random variables by random number and function generators, basic programming concepts, characteristics of simulation languages. 3 lectures, 1 laboratory. Prerequisite: ENGR 251, IE 305, IE 312.

**IE 421 Manufacturing Organization (3)**

Theory and principles of manufacturing organizations. History of industrial organization. Engineering management concepts and practice. Use of case discussion method. Planning and operations in terms of human and other resources and factors within and external to the firm. 3 seminars. Prerequisite: IE 363, PSY 202.

**IE 425 Reliability Assurance (3)**

Reliability mathematical models, mechanical device reliability, electrical device reliability, reliability data, assurance program elements. 3 lectures. Prerequisite: MATH 242, STAT 321, IE 305.

**IE 426 Engineering Test Design and Analysis II (3)**

Techniques used in model building and testing for industrial engineering and operations research. Multi-attribute criteria; nonlinear regression; and nonparametric analysis for manufacturing and operations problems. Data gathering and analysis using statistical packages. 2 lectures, 1 laboratory. Prerequisite: IE 305, IE 326.

**IE 430 Statistical Quality Control (3)**

Statistical theory of sampling for managerial control of quality of services or processes, by variables or by general attributes. Decisions based on sampling using operating characteristics and control charts to delineate risks. Experiments with problem solving in labs. 2 lectures, 1 laboratory. Prerequisite: IE 326.

**IE 437 Human Factors Engineering II (4)**

Principles, concepts and models used in maximizing human performance capabilities at the workplace. Experimental methods for generating rational data relative to man-machine interface. Data and multi-variate analysis. 3 lectures, 1 laboratory. Prerequisite: IE 319, IE 426.

**IE 441, 442 Fundamentals of Supervision (2) (1)**

Theory and principles of supervision. Application of fundamental concepts and techniques of supervision provided by assignment in manufacturing laboratories. 2 laboratories, 1 laboratory. Prerequisite: IE 141, IE 233 and senior standing.

**IE 461, 462 Senior Project (2) (3)**

Faculty supervised projects typical of problems which graduates encounter in their profession and which involve costs, planning, scheduling and research. Formal written report, suitable for reference library, discussing methods, results and conclusions. Minimum 150 hours total time. Prerequisite: IE 334, IE 343, IE 314 and consent of department.

**IE 463 Undergraduate Seminar (2)**

Preparation, oral presentation, and discussion by students of technical papers on recent engineering developments and/or subject matter pertinent to industrial engineering. 2 seminars. Prerequisite: IE 462 concurrent or consent of instructor.

**IE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**IE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**IE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**IE 541 Advanced Operations Research (3)**

Models for mathematical programming and operations research. Mathematical programming topics in linear programming, network analysis, and dynamic programming. Operations research models will include queuing, inventory models, simulation, and Monte Carlo. Special analysis problems in nonlinear programming and integer programming. 3 seminars. Prerequisite: IE 305, IE 426 and graduate standing or consent of instructor.

**IE 542 Reliability Engineering (3)**

Theory and techniques for determining the reliability of systems and system elements. Influence of failures in series, parallel, and redundant designs. Failure modes and effects. Frequency distributions of failures and failure rates. Methods of estimating, predicting, measuring, and testing for reliability and effectiveness. 3 seminars. Prerequisite: IE 426, IE 430, graduate standing or consent of instructor.



**IE 543 Advanced Human Factors (4)**

Theory and application of man-machine relations and system design. Concepts of mathematical models, human information input channels, decision making based on capability of human operator. 3 seminars, 1 laboratory. Prerequisite: IE 319 or equivalent, IE 426, graduate standing or consent of instructor.

**IE 544 Advanced Topics in Engineering Economy (3)**

Advanced topics in engineering economy including replacement analysis, capital budgeting and allocation theory, risk and uncertainty, and benefit-cost analysis. Impact of governmental and industrial policy. 3 seminars. Prerequisite: IE 314 and graduate standing.

**IE 545 Advanced Topics in Simulation (3)**

Validation of simulation models; statistical techniques for variance reduction. Experimental design and optimization. Comparison of attributes of simulation language. Review of current manufacturing and service industry applications. 2 seminars, 1 laboratory. Prerequisite: IE 420 and graduate standing.

**IE 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

**IT—INDUSTRIAL TECHNOLOGY****IT 101 Technical Problem Solving (3)**

Intensive investigation of the three major steps in technical problem solving. Defining the problem; planning and implementing the process for determining the solution; effective communication of the solution. Modern information processing systems. 3 lectures.

**IT 111 Introduction to Plant Engineering (2)**

Survey of career opportunities in plant engineering. Job entry requirements and employment procedures. Technical and professional preparation. 2 lectures.

**IT 125 Industrial Wood Processes (3)****GEB F.2.**

Theory and practice relating to basic woodworking processes, materials and equipment used in cabinetmaking and furniture industries. Practical applications include the construction of a project. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities.

**IT 130 Automotive Fundamentals (2)****GEB F.2.**

Principles of operation and familiarity with basic components of the automobile from the consumer viewpoint. Economics of selection, operation, and preventive maintenance. Practical experience, owner inspection, maintenance and repair for beginners. Understanding of pollution control systems. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory.

**IT 141 Plastics Processes and Applications (1)****GEB F.2.**

Uses, capabilities, and operational characteristics of plastics machinery and process fabrication equipment. Properties and classes of molds, tools. Plastics processes and applications. Introduction to injection molding, extrusion, compression molding, rotational molding, foaming, casting, and plastic fabrication techniques. Miscellaneous course fee required—see *Class Schedule*. 1 laboratory.

**IT 229 Industrial Materials (3)**

Investigation of the characteristics, applications and limitations of materials of industry including: organics, ceramics and metallics. 2 lectures, 1 activity.

**IT 233 Metal Technology (3)****GEB F.2.**

Theory and practice in care and use of hand and machine tools. Applications of welding, forging, foundry, sheet metal, ornamental metal, electroplating and bench metal processes to the fabrication of metal products. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities.

**IT 235 Industrial Drawing (2)**

Methods, policies and practices used in preparing, reading and applying industrial and construction drawings, their techniques and language to the industrial and construction projects, presentations and proposals common to the management and construction industries. 1 lecture, 1 laboratory. Prerequisite: ETME 131 or high school drafting.

**IT 237, 238 Industrial Electricity (3) (3)**

Theory and application of basic a.c. and d.c. circuits as they pertain to industry and teaching applications. Magnetic circuits. Principles of motors and generators, instruments, control and control circuits, transformers and circuitry, oscilloscopes. 2 lectures, 1 laboratory.

**IT 245 Technical Sketching (2)**

Freehand sketching of industrial products using perspective, isometric oblique and orthographic projection. Shading. Basic design. 2 activities.

**IT 250 Transportation Power (3)**

Introduction to world transportation and transportation power: land, sea, air and space transport systems, regulation, operational theory; piston, rotary and turbine engines; ignition, fuel, charging, cooling and lubrication systems. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory.

**IT 302 Plastics Design (2)**

Properties of plastics as a class of materials. Interpretation of plastic design data. Principles underlying the properties of plastics. Design problems. Laboratory applications of plastics processes and their effects on design. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 laboratory. Prerequisite: CHEM 122 or CHEM 125 or consent of instructor.

**IT 304 Product Quality Control (3)**

Applications at the supervisory level of the overall quality plan for manufacturing. Quality assurance, testing, shop and field inspection techniques, material review, source inspection, vendor surveillance, and quality audit. 3 lectures.

**IT 305 Technical Presentations (3)**

Preparation of students for addressing groups of people on technical topics using available audiovisual media. 1 lecture, 2 activities. Prerequisite: Junior standing, IT 235, IT 245, SPC 201 or SPC 202.

**IT 311 Plant Safety Fundamentals (3)**

Fundamentals of safety management, background liabilities and safety legislation, hazards and their control in industry and industrial education: falls, falling objects, impacts, mechanical injuries, pressure, electrical, fires, explosions, toxic materials, radiation, vibration, noise. 2 lectures, 1 activity. Prerequisite: Junior standing.

**IT 315 Alternate Energy Technology (3)**

Investigating the theory, cost and construction of alternate energy supply and use systems. Solar (passive and active) hot water and house heating. Wind system components including rotor, generator, relays, site selection. Alcohol production and use as a fuel. 2 lectures, 1 activity.

**IT 322 Energy and Power (4)**

Introduction to energy sources, energy conversion and power, includes fossil, atomic and solar resources, conversion by current power technology including reactors, internal, external combustion and direct conversion. Power transmission systems and system maintenance including electrical, mechanical, pneumatic and hydraulic systems. Automobile used as one exemplary system. 4 lectures.

**IT 324 Modern Industrial Finishes (2)**

Characteristics and applications of modern industrial finishes to products of industry. Practical experiences in the application of select modern industrial finishes and refinishing. Miscellaneous course fee required—see *Class Schedule*. 2 activities.

**IT 326 Product Development and Evaluation (3)**

Practical application of value analysis and production quality control techniques as applied to industrial products; methods of product development and the interaction between marketing and production functions and design engineering. 2 lectures, 1 activity. Prerequisite: IT 101.

**IT 327 Plastics Technology (3)**

Materials, processes and applications of industrial polymers. Basic operations in processing, fabricating and finishing of thermal plastic and thermal setting resins, product and materials testing. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 activity. Prerequisite: CHEM 122.

**IT 330 Fundamentals of Industrial Packaging (3)**

Overview of packaging: historical development, functions, and materials, processes and technology employed to protect goods during manufacture, handling, shipment and storage. Container types, package design, development, research and testing. Economic importance and perspective as an industrial activity. 3 lectures. Prerequisite: Junior standing.

**IT 331 Advanced Industrial Electrical Systems (4)**

Industrial applications of electrical power distribution systems, industrial wiring, illumination, motors and controllers. Field trips. 3 lectures, 1 activity. Prerequisite: IT 238, MATH 131

**IT 332 Electronic Control Systems (4)**

Automated control devices from an operational and servicing viewpoint. Modular approach to the study of electronic control systems. Field trips. 3 lectures, 1 laboratory. Prerequisite: PHYS 122, IT 237

**IT 333 Electronic Computer Applications (4)**

Fundamentals of analog and digital computers and numerical control machines, number systems, logical and sequential circuits and devices, basic and A.P.T. languages, computer aided design and manufacturing. Word processing, simulation, documentation, personal computers and process control. 3 lectures, 1 laboratory. Prerequisite: IT 101, or consent of instructor.

**IT 334 Materials Handling and Packaging (3)**

Technical interrelationships between materials handling and industrial packaging: design, materials, quality control, packaging and product manufacturing, storage, transportation and marketing. 2 lectures, 1 activity. Prerequisite: IT 330.

**IT 337 Advanced Plastics Processes (3)**

Advanced plastics processing techniques and principles, operation of thermoplastic and thermosetting polymer processing and testing equipment. Plastics processing behavior. Plastics machinery instrumentation, control and evaluation. Polymer flow and deformation evaluation. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: IT 327.

**IT 340 Automotive Technology, Engines (3)**

Engine overhaul and maintenance, theory and construction. Practical activities with various types of engines, including automotive, marine, motorcycle, and low horsepower power plants. 1 lecture, 2 laboratories. Prerequisite: IT 250.

**IT 342 Automotive Technology, Engine Heads (3)**

Theory and operation of automotive cylinder heads, valve train for both spark ignition and diesel engines. Maintenance including testing, machine processes, rebuilding procedures and adjustments. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: IT 250.

**IT 344 Automotive Technology, Chassis (3)**

Fundamental, technical, and teaching aspects of automotive suspension systems, steering, braking, and other control systems. Tires and lubrication. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: IT 250.

**IT 350 Quality Systems Applications (3)**

Philosophy and principles of quality system administration. Relationship to total systems program administration; impact on management information and data requirements. Quality system administration techniques applied to control performance, cost and schedule data, traceability, and retrievability. 3 lectures. Prerequisite: MATH 120, junior standing.

**IT 352 Additional Laboratory Problems (1–2)**

Advanced instruction in design, materials, construction and repair in the various industrial arts areas. Total credit limited to 4 units with not more than 2 units in any one quarter. Miscellaneous course fee required—see *Class Schedule*. 1 or 2 laboratories. Prerequisite: Consent of instructor.

**IT 353 Furniture Design and Construction (3)**

Theory and practice in the application of design principles, materials and construction techniques as related to the manufacture of fine furniture. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: IT 125.

**IT 354 Woodworking Machine Tool Maintenance (3)**

Theory and practice in the maintenance and repair of hand tools, portable power tools and major power machinery related to the area of woodworking. 1 lecture, 2 activities. Prerequisite: IT 125.

**IT 355 Cabinetmaking (3)**

Examination of modern materials and construction techniques as related to cabinetmaking. Field work in comprehensive projects stressing decision making and design solutions to the problems of cabinetmaking. Team projects with emphasis on job organization, scheduling and construction. 1 lecture, 2 activities. Prerequisite: IT 125.

**IT 356 Building Construction (3)**

Examination of modern materials and methods of construction as related to residential construction. Team field work on actual construction projects, including decision making and design solutions, job organization, scheduling, bidding procedures and building codes. 1 lecture, 2 laboratories. Prerequisite: IT 125.

**IT 400 Special Problems for Advanced Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**IT 404 Customer Relations (3)**

Customer contacts; personal relationships, ethics, legal relationships, service contracts, communication channels. 3 lectures. Prerequisite: MKTG 301 or equivalent, senior standing or consent of instructor.

**IT 405 Industrial Marketing (3)**

Investigation of the institutions and channels involved in industrial marketing. Analysis of industrial products, competitors, and consumers. Problems in marketing research, personnel, and management. Individual reports on industrial products, companies or training programs. 3 lectures. Prerequisite: MKTG 301 or equivalent.

**IT 406 Industrial Cost Control (3)**

Application of cost control techniques and processes for the industrial manager; techniques and procedures of cost reduction. Investigate methods of reducing waste and inefficiency in business and industry considering labor processes, products, materials and systems. 3 lectures. Prerequisite: Senior standing or consent of instructor.

**IT 407 Industrial Product Development (3)**

Organization for new industrial product development, linking marketing, operations and technology functions; sources and screening of new product ideas, sizing and evaluation of market prospects, budgeting, pricing, timing, advertising and distribution factors as they relate to new industrial products, internal coordination during product development phases. 3 lectures. Prerequisite: IT 404, IT 405 or consent of instructor.

**IT 408 Protective Packaging (3)**

Principles of protective packaging development. Packaging of different classes of products. Materials and test methods for cushioning, blocking, barriers, packing. Development of cushion design, problem solving. Analysis of package configurations, closing features, locking devices and labels. Examination of permeability of materials to gases, vapors and liquids, considerations of biological protection of packages and packaging materials. 2 lectures, 1 laboratory. Prerequisite: IT 330, PHYS 121, CHEM 121, MATH 131, or equivalent.

**IT 409 Machinery For Packaging (3)**

Analysis of major types of packaging machinery from a practical, operational and marketing viewpoint. Basic processes utilizing packaging machinery. Specialized operations, contract specifications, selection, operation and maintenance. Required field trips to packaging operations. 2 lectures, 1 laboratory. Prerequisite: IT 330, PHYS 121 or equivalent.

**IT 410 Drafting: Industrial Education (2)**

Teaching applications of drafting principles, home planning, sketching, rendering and industrial working drawings. For high school industrial arts drafting teachers. Field trips to industrial drafting offices. 2 activities. Prerequisite: IT 235 or consent of instructor.

**IT 412 Industrial Illustration (3)**

Fundamental theories and techniques involved in the preparation of industrial technical illustrations and industrial drawings and photographs for duplication processes and presentation purposes. Experiences in delineation, use of pastels, brush and air brush. Miscellaneous course fee required—see *Class Schedule*. 3 activities. Prerequisite: IT 245 or consent of instructor.

**IT 413 Plant Maintenance Management (3)**

Maintenance function. Maintenance repair, and operations of industrial plant facilities including utility and mechanical systems, preventive maintenance, job control systems, work estimating, budgeting, other essential services. 3 lectures. Prerequisite: IT 415, IT 416.

**IT 414 Industrial Energy Conservation (3)**

Energy management, auditing, costing in industrial facilities. Power factor, lighting, process recycling, heating cooling losses, solar energy. 3 lectures. Prerequisite: ACTG 211, IT 331, IT 415 or consent of instructor.

**IT 415 Industrial Equipment and Systems (3)**

Major mechanical equipment and systems making up the utility and production support systems of a modern industrial facility. 3 lectures. Prerequisite: IT 331, IT 431 or consent of instructor.

**IT 416 Industrial Power and Lighting (3)**

Major power systems in a modern industrial plant, including electrical distribution systems and industrial and commercial illumination. Planning and budgeting of industrial power and lighting systems. 3 lectures. Prerequisite: IT 331, IT 415.

**IT 417 Plant Facilities Management (3)**

Management of the modern industrial facility, including capital and operating budgeting, forecasting, organization. 3 lectures. Prerequisite: IT 413, IT 415, IT 416, ECON 212.

**IT 418 Technical Management Problems (4)**

Organization and positions of key personnel in corporate technical management structure; their functions, duties and interfaces with operations, marketing, general management and research/development. Structure and objectives, related specifications and proposals with case studies. 3 lectures, 1 activity. Prerequisite: Senior standing, MGT 311, or consent of instructor.

**IT 419 Industrial Internship (2-6) (CR/NC)**

Part-time industrial experience, with or without pay. Conducted under company and faculty supervision. Guided observations related to technical management. Report of experiences required at end of quarter. Credit/No Credit grading.

**IT 423 Computer Hardware (3)**

Hardware survey and investigation for educators, technical people and professionals not having a computer background. CPU, RAM, ROM UART, interfaces, key-board encoders, disk drives, and printers. Information on selection, expansion, connection and capabilities of computer systems. Lecture supplemented with A-V, demonstrations and hands-on familiarization of hardware. 3 lectures. Prerequisite: CSC 101 or CSC 110 or CSC 118.

**IT 424 Curriculum and Methods of Industrial Education (3)**

Industrial education curriculum and instructional processes. Organization, selection, presentation, application, interpretation and evaluation for teaching automotives, drafting, electronics, graphic arts, metals, plastics, power mechanics, woodworking. Preparation for student teaching. Field trips. 2 lectures, 1 activity.

**IT 425 Automotive Technology, Fuel Systems (3)**

Fuel systems and fuels used in internal combustion engines. Carburetor, fuel injection, turbo-chargers, manifolds, pumps, and storage tanks. Emission control systems. Types of fuels and their compounding. 2 lectures, 1 laboratory. Prerequisite: IT 250.

**IT 427 Automotive Technology, Electricity and Electronics (3)**

Applications of electronics and electrical systems in automotive type equipment including ignition, lighting, starting, charging, auxiliary systems, and control systems. 2 lectures, 1 laboratory. Prerequisite: IT 250.

**IT 429 Automotive Technology: Tune-up (3)**

Theory and service of automotive systems related to engine performance. Function and use of service equipment, manufacturers specifications and automotive components relating to starting, charging, ignition, fuel, emission control and exhaust systems. 1 lecture, 2 activities. Prerequisite: IT 250 or consent of instructor.

**IT 431, 432 Mechanical Systems (3) (3)**

Application of laws of physics and thermodynamics to various systems. Engines, pumps, heat exchange, piping, hydraulics, pneumatics, refrigeration, air conditioning, nuclear energy. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, Prerequisite: MATH 131, PHYS 122, IT 222.

**IT 433 Production and Process Management (3)**

Production equipment and systems, metals, measurement, tooling and finishes. Mass production. Production management. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 activity. Prerequisite: IT 229.

**IT 435 Package Development Management (3)**

Managing the development of industrial and consumer goods packaging from concept to market place. Interplay of marketing, economic, technical, production and distribution considerations in developing a package. Organizing the package function for best results. Case studies of package/product successes and failures. Class project for analysis and solution. 3 lectures. Prerequisite: IT 330, IT 408, IT 409.

**IT 437 Reinforced Plastics (3)**

Mold preparation and production of reinforced plastic products. Standard specifications for reinforced materials and resin systems. 1 lecture, 2 laboratories. Prerequisite: IT 327 or consent of instructor.

**IT 438 Plastics Mold Construction (3)**

Properties and characteristics of thermosetting and thermoplastic materials. Analysis and construction of molds and dies for use with reinforced plastics, injection molding, thermoforming processes; extrusion, and compressions and transfer molding and polymer castings. Selection of plastics. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: IT 327 or consent of instructor.

**IT 441 Metal Production Processes (3)**

Mass-production techniques; design, production planning, tolerances, jigs and fixtures, interchangeable parts, assembly line. Design and construction of projects suitable for industrial production products. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: IT 233 or IT 433 or IT 443.

**IT 443 General Metals (3)**

Theory and application of various metal processes. Problem solving in joining, casting, machining and forming as applied in industrial education and industrial fabrication. Maintenance of metalworking equipment. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 activities. Prerequisite: IT 233.

**IT 444 Technical Drawing: Industrial Education (3)**

Application of current drafting procedures in preparing complete graphic descriptions of industrial components. Sketching, lettering, instrument drawing. Preparation of work drawings and specifications. Analysis of drafting materials, equipment and processes. 1 lecture, 2 activities. Prerequisite: IT 235, IT 245, ETME 142, or consent of instructor.

**IT 446 Wood Production Processes (2)**

Mass-production techniques as related to woodworking. Design and construction of jigs and fixtures to facilitate assembly line production of selected projects. 2 activities. Prerequisite: IT 125.

**IT 461 Senior Project (3)**

Selection and completion of a project under faculty supervision. Projects are typical of problems graduates must solve in their field of employment. Project results are presented in a formal report and must be completed during two consecutive quarters. Minimum 90 hours total time. Prerequisite: Senior standing.

**IT 463 Industrial Technology Seminar (3)**

Functions, philosophies and current trends of industry. Content will be presented using such methods as lectures, guest lecturers, panel discussions and debates. 3 seminars. Prerequisite: Senior standing.

**IT 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**IT 471 Selected Advanced Activity (1-3)**

Directed group study for advanced undergraduate and graduate students. Class schedule will list topic selected. May be required with IT 470. Total credit limited to 6 units. 1 to 3 activities. Prerequisite: Consent of instructor.

**IT 500 Individual Study (1-6)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: Consent of department head or graduate adviser and supervising faculty member.

**IT 505 Experimental Projects in Technology (3)**

Organize, build, and conduct experimental projects using research techniques. Physical problem solving initiated through research by the student. Prerequisite: Graduate standing.

**IT 515 History and Philosophy of Industrial Education (3)**

Development of industrial education from its initial conception to the present time. Current philosophical concepts of the field. 3 seminars. Prerequisite: Graduate standing.

**IT 520 Organization and Administration of Industrial Education (3)**

Case studies of current problems in the administration and organization of industrial arts and industrial-technical education. Problems in industry, financing industrial education, work-experience and adult education programs, and community education. 3 seminars. Prerequisite: Graduate standing.

**IT 521 Curriculum in Industrial Education (3)**

Basic principles and practices in the preparation of course guides, courses of instruction and related materials for industrial instruction. 3 seminars. Prerequisite: Graduate standing.

**IT 522 Facility Planning in Industrial Education (3)**

Analysis of major factors in planning and designing industrial education laboratories and related areas. Includes State standards, equipment specifications, and presentation displays. 3 seminars. Prerequisite: Graduate standing.

**IT 527 Trends and Issues in Industrial Education (3)**

Guided study and discussions of current and innovative practices in industrial education. Identification of major issues facing the industrial educator. Development of a personal philosophy of industrial education. 3 seminars. Prerequisite: Graduate standing.

**IT 580 Graduate Research in Industrial Education (3)**

Advanced study and analysis of selected topics and problems in industrial education. 3 seminars. Prerequisite: Graduate standing.

**IT 599 Industrial Education Thesis or Project (5)**

Each student will propose, develop and complete a thesis or project involving individual research that is significant to the field of industrial education. Prerequisite: Acceptable academic standing in the master's degree program in Industrial and Technical Education and consent of instructor.

## **JOUR—JOURNALISM**

**JOUR 118 Mass Media in Society (3)**

Examination of the mass media, their methods, purposes, and functions. Responsibilities of journalists; importance of media in society, 3 lectures.

**JOUR 201 Journalism History (3)**

Survey of historical influences in the development of today's journalism. 3 lectures.

**JOUR 203 Reporting I (3)**

Techniques of news reporting and writing. Intensive practice in gathering and evaluating information and writing basic news stories. 2 lectures, 1 two-hour laboratory. Prerequisite: ENGL 114, and typing proficiency.

**JOUR 205 Agricultural Communications (3)**

Survey of the media of agricultural communication: newspaper farm pages and sections, general and specialized agricultural magazines, farm broadcasts on radio and TV; public and private agencies involved in agricultural communication. 3 lectures.

**JOUR 233 Copy Editing (3)**

Copy desk work: rewriting, editing, and headlining news copy. Selecting, cropping, and captioning news photos. 1 lecture, 2 two-hour laboratories. Prerequisite: JOUR 203.

**JOUR 302 Law for Journalists (3)**

State and federal laws affecting journalists. Hazards of libel and what defenses are recognized; contempt of court, right of privacy; study of postal regulations, regulations in advertising, broadcasting, photography, and business regulatory statutes; ethics and responsibility of the press and broadcast media. 3 lectures.

**JOUR 304 Reporting II (3)**

Advanced news reporting and writing. Extensive practice on campus in interviewing, beat reporting, covering speeches and meetings and use of library and other information resources. 2 lectures, 1 two-hour laboratory. Prerequisite: JOUR 203.

**JOUR 312 Introduction to Public Relations (3)**

Principles of public relations and public opinion; methods employed in dissemination of public information by various organizations. 3 lectures.



**JOUR 323 Photojournalism (3)**

Application of photographic techniques to journalism. Use of lighting, particularly electronic flash. Use of 35mm camera and other cameras in journalism. Introduction to the principles of news photography for television. Application of darkroom techniques suitable for news media deadline requirements. Assignments using still cameras and black and white film. Integration of photographic and writing skills. 2 lectures, 1 laboratory. Prerequisite: JOUR 203, ART 221.

**JOUR 326 Broadcast Announcing (3)**

Radio and television announcing of news, sports, special events, commentary, features, commercials, and talk and discussion. 1 lecture, 2 activities. Prerequisite: SPC 201 or SPC 202.

**JOUR 331 Advertising (3)**

Principles of advertising, advertising psychology, salesmanship, copy, layout, and production for print and broadcast media. 3 lectures.

**JOUR 333 Broadcast News I (3)**

Radio news course with emphasis on live and taped interviews, newscast production and presentation, reporting, and broadcast newswriting style. 2 lectures, 1 two-hour laboratory. Prerequisite: JOUR 203.

**JOUR 342 Public Relations Media (3)**

Writing and editing for magazines, smaller format publications and visual presentation. 3 lectures. Prerequisite: JOUR 203 and JOUR 312 or consent of instructor.

**JOUR 351 Journalism Practice (2)**

Credit arranged by sections as indicated by subtitle for students holding editorial or photographic positions on *Mustang Daily*, radio station KCPR, or other similar supervised experience. 2 laboratories. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**JOUR 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

**JOUR 401 International Press (3)**

Global communications facilities and operations; world transmission of information; survey of world wire services and international print and broadcast news media. Analysis of press operations under varying government ideologies. 3 seminars. Prerequisite: Junior standing.

**JOUR 405 Reporting III (3)**

Specialized, investigative and interpretative reporting and writing. Frequent off-campus assignments, with a focus on law enforcement, courts and governmental affairs. 2 lectures, 1 two-hour activity. Prerequisite: JOUR 304.

**JOUR 407 Magazine Writing (3)**

Feature writing techniques. Markets for nonfiction articles; practice in research and preparation of articles. 3 lectures. Prerequisite: JOUR 203 or consent of instructor.

**JOUR 413 Advanced Public Relations (3)**

Methods employed in dissemination of public information by organizations. Survey of media, case histories, formation and measurement of public opinion. 3 lectures. Prerequisite: JOUR 203, JOUR 312, JOUR 351 or consent of instructor.

**JOUR 425 Advertising Layout and Copywriting (2)**

Advertising typography and illustration, application of production processes in making of layouts and writing of copy. 1 lecture, 1 two-hour laboratory. Prerequisite: JOUR 331 or consent of instructor.

**JOUR 432 Broadcast News II (3)**

Video tape and filmed television news interviews, reports, and features. Television continuity and newswriting. Production of television public affairs broadcasts. 2 lectures, 1 laboratory. Prerequisite: JOUR 333, ART 221 or consent of instructor.

**JOUR 434 Advanced Editing (3)**

Daily experience and responsibilities in editing and rewriting news and feature stories. Practical application of headline writing and page makeup principles. 1 lecture, 2 two-hour laboratories. Prerequisite: JOUR 233, JOUR 304.

**JOUR 444 Media Internship (4)**

Application of techniques on daily basis with media under supervision of department faculty. Prerequisite: Junior standing in Journalism.

**JOUR 460 Senior Project (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 90 hours total time.

**JOUR 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

## LA—LANDSCAPE ARCHITECTURE

**LA 110 Graphic Communication for Landscape Architects (3)**

Communication through descriptive drawing and professional plan graphics, including theories of perspective. 3 laboratories.

**LA 111 Three Dimensional Graphics for Landscape Architects (3)**

Elements of three dimensional perception/visualization with emphasis on freehand and mechanical perspective drawing methods. 3 laboratories. Prerequisite: LA 110.

**LA 152 Fundamentals of Design and Planning in Landscape Architecture (4)**

Exploration of design and planning projects on different scales and in different environmental settings: site, community, city, region. Introduction to the principles of environmental design including basic design elements and composition. Contextual understanding of landscape architecture and other environmental design disciplines. Identification of natural and cultural elements in the environment. 4 laboratories.

**LA 201 Introduction to Landscape Architecture (2)****GEB F.2.**

Survey of the profession of landscape architecture from small space design to regional planning. Relationships between landscape architecture and society and professionals in related fields. 2 lectures.

**LA 203 Applied Design and Planning Fundamentals (3) (Also listed as CRP 203)**

Focus on the application of basic design fundamentals and design of environments through a series of design exercises. 3 laboratories. Prerequisite: EDES 202, LA 213, with LA 152 for LA majors only.

**LA 213 Site and Terrain Analysis (3-4)****GEB F.2.**

Introduction and application of selected inventory and analysis techniques through interpretation, reading and evaluation of land and terrain descriptions including maps, air photos, soil survey, hydrologic studies, contour and landform models. Projects range in size and scope from limited sites to regional areas. 2 lectures, 1-2 laboratories.

**LA 231 Landscape Architecture Construction (3)**

Introduction to basic principles and methods of landscape architectural landform manipulation. 3 laboratories.

**LA 240 Additional Landscape Architecture Laboratory (1-2)**

Total credit limited to 4 units with not more than 2 units in any one quarter. 1 or 2 laboratories.

**LA 300 Internship (3) (CR/NC)**

Involvement in a work setting related to landscape architecture. Thirty hours work experience per unit of credit. Credit/No Credit grading only. Prerequisite: Third year standing.

**LA 310 Introduction to Computing in Planning and Design (2)**

Introduction to computing for planning and design students. Familiarization with micro and main-frame computer hardware currently being utilized by the profession and programming concepts germane to application programs used in the Department of Landscape Architecture. 1 lecture, 1 laboratory. Prerequisite: CSC 110 and second year standing or consent of instructor.

**LA 311 History of Landscape Architecture (3)****GEB F.2.**

Historical evaluation of man's interaction with outdoor space. Analysis of influences that direct, perpetuate, and form the landscape. 3 lectures.

**LA 312 Graphic Methods for Landscape Architects (2)**

Exposure to practice and applications of up-to-date graphic methods for presentation and production of landscape architectural works. Reprographic techniques, machine and computer aided drafting systems. Specific subject matter and projects will vary each time course is offered. Course may be repeated. 2 laboratories. Prerequisite: EDES 112 and third year standing.

**LA 313 Architectural Design for Landscape Architects (3)**

Exposure to architectural design concepts and theories with attention given to historical and contemporary case studies. Discussions and field trips emphasize architectural implications of materials and methods of construction. 2 seminars, 1 activity. Prerequisite: Third-year standing.

**LA 321 Concepts in Environmental Decision Making (3)****GEB F.2.**

Investigation of theoretical and attitudinal bases of environmentally concerned disciplines. Ecology, perception, behavior and design studies as organizational principles and theories in developing understanding of interface between built and natural environments. 3 lectures.

**LA 323 History of Twentieth Century Landscape Architecture (3)**

Work, philosophies and design theory of important personalities in the environmental design disciplines of the twentieth century. 3 lectures. Prerequisite: At least one course in either architecture, landscape architecture or planning history.

**LA 341, 342, 343 Landscape Architecture Construction (3) (3) (3)**

Theory and application of landscape architectural construction working drawings, specification, codes, regulations, and contractual agreements. 3 laboratories. Prerequisite: LA 231; ARCE 311 for LA 342. Concurrent: LA 203, LA 352, LA 353.

**LA 344 Form and Materials (3)**

Development of understanding of contemporary materials and their use in design development. Direct working experience with three dimensional design related to stone, metal, wood, glass, clay and plastics. 3 laboratories. Prerequisite: Third-year standing or consent of instructor.

**LA 347 Landscape Plant Composition (3)**

Plant characteristics and ecological conditions as constraints and opportunities for the landscape architect. Selection of plant materials for design effect. 3 laboratories. Prerequisite: LA 203, BOT 238, OH 238.

**LA 348 Advanced Landscape Plant Composition (3)**

Preparation of landscape planting contract documents. Emphasis on understanding installation, maintenance, and irrigation of planted areas as related to design and composition. 3 laboratories. Prerequisite: LA 341, LA 347, LA 351, AE 337.

**LA 351, 352 Design for Landscape Architects (4) (4)**

Process oriented site designs with emphasis on spatial design site analysis, landform, plantform, builtform, circulation, detail design and graphic communication. 4 laboratories. Prerequisite: LA 203, LA 213, LA 341.

**LA 353 Design for Landscape Architects (4)**

Completion of design project, selected by instructor, of sufficient scale and complexity to encompass most fundamental design and technical decisions common to landscape architectural construction projects. Conceptual, design development, and working drawings prepared as a complete set. 4 laboratories. Prerequisite: LA 342, LA 352, LA 348, LA 441, CM 325. Concurrent: LA 343.

**LA 363 Recreation and Open Space Planning and Design (3)**

Planning and design methods for meeting leisure requirements; issues of recreation and society; relationship of recreation and open spaces; assessment of needs and supply of resources. 3 lectures. Prerequisite: Must have completed minimum of one 200-level course in planning, design or recreation and third-year standing or consent of instructor.

**LA 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**LA 410 Information Systems for Landscape Architecture (2)**

Introduction and hands-on experience with computerized spatial information systems utilized in design and planning. Emphasis on existing computer programs for use on both micro computers and the campus computing facilities. 1 lecture, 1 laboratory. Prerequisite: CSC 110 and third-year standing or consent of instructor.

**LA 411 Regional Landscape History (3)**

Developmental history of the landscape in the western region with specific focus on the Basin and Range and Pacific regions. 3 lectures. Prerequisite: Fourth-year standing or consent of instructor.

**LA 441, 442 Professional Practice (2) (2)**

Office organization, contract documents and specifications. Ethics, problems and practices in the profession of landscape architecture. 2 activities. Prerequisite or concurrent: LA 342, LA 352, third-year standing or consent of instructor.

**LA 451 Design for Landscape Architects (5)**

Emphasis in regional landscape assessment and design techniques; large scale environments; issues in land use planning and design. 5 laboratories. Prerequisite: LA 343, LA 353.

**LA 452 Design for Landscape Architects (5)**

Emphasis in urban and community design issues related to landscape architecture; scales of investigation and application; community involvement techniques. 5 laboratories. Prerequisite: LA 343, LA 353.

**LA 453 Advanced Landscape Architecture Design (5)**

Student selection and completion of approved design or research project sufficient in scale and complexity to encompass issues common to landscape architecture. Time management, documentation, and communication skills emphasized. 5 laboratories. Prerequisite: LA 343, LA 348, LA 353, fourth-year standing. Recommended or concurrent: LA 441, LA 442.

**LA 454, LA 455, LA 456 Design for Landscape Architects (5) (5) (5)**

Advanced design studio. Emphasis is on complex design problems and special environmental situations or interdisciplinary work and involvement in current design issues. At least one course in the series must be self-directed. 5 laboratories. Prerequisite: Completion of fourth-year design-sequence (LA 451, LA 452, LA 453).

**LA 461 Senior Project (3)**

Selection and completion of a comprehensive project under faculty supervision. Problems to involve the student's technical and creative skills. 90 hours minimum total time. Prerequisite: LA 343, LA 353, LA 463.

**LA 463 Undergraduate Seminar (2) (CR/NC)**

Exploration of issues and problems in the environmental design field. Research methods; preparation of a proposal for senior project. Credit/No Credit grading. 2 seminars. Prerequisite: Fourth-year standing in degree major.

**LA 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

**LA 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.

**LA 481 Visual Resource Management Methods (3)**

Investigation and application of the major visual resource management methods relevant to landscape architecture. Theoretical basis for visual resource assessment, the different assessment techniques, and the process of translating assessment results into visual resource management techniques. 2 lectures, 1 laboratory. Prerequisite: Fourth year or graduate standing.

**LA 482 Evaluating Social and Behavioral Factors for Open Space Design (3)**

User oriented approach to open space design. Interview and survey techniques, behavioral trace mapping and systematic observation, post occupancy evaluation and similar methods are used to generate user input and feedback in the design process. Understanding the behavioral implications of designed environments. 2 lectures, 1 laboratory. LA 432, fourth-year or graduate standing or consent of instructor.

**LA 483 Special Studies in Landscape Architecture (1-12)**

Special issues and problems through research, field trips, seminars and other forms of investigation and involvement. Course requirements are determined prior to each individual project through a contractual agreement between students and department. Departmental Off Campus Study Program guidelines apply. Prerequisite: Fourth or fifth year standing.

**LA 551 Regional Landscape Assessment I (4)**

Definition, research and filing of data covering the biological, cultural and physical resources of a specific region. Concepts of regionalism, land planning, reclamation and preservation are integral to the course. Utilization of mainframe and microcomputer facilities and software. 4 laboratories. Prerequisite: LA 420, LA 473, graduate standing or consent of instructor.

**LA 552 Regional Landscape Assessment II (4)**

Application of data manipulation techniques in order to model both impacts on natural systems and land development potentials. Use of planning strategies to predict outcomes resulting from the land use decision process. Utilization of mainframe and microcomputer facilities and software. 4 laboratories. Prerequisite: LA 551 and graduate standing.

**LIB—LIBRARY****LIB 101 Library Instruction (1)**

Instruction and practice in the use of the card catalog, reference books, periodical indexes, government documents, and other library materials. Development of student independence and initiative in using the library as a source of information. 1 lecture.

**LIB 301 Library Resources and Literature Searches (1)**

Sources of information in major subject fields. Reference materials, bibliographic aids, indexing and abstracting tools, periodicals, serials, and other sources. Techniques used in literature searches and preparation of bibliographies. Class schedule will list major subject area covered. Total credit limited to 3 units. 1 lecture. Prerequisite: Junior, senior or graduate standing or consent of instructor.

**LS—LIBERAL STUDIES****LS 461 Senior Project (3)**

Selection and completion of a project or report under faculty supervision. Topic must be chosen with departmental approval. Results must be presented in a formal, written report. Total credit limited to 6 units with a maximum of 3 units per quarter. Prerequisite: Advanced composition, senior standing, and consent of Liberal Studies Coordinator.

## MATH—MATHEMATICS

Satisfactory completion of the Entry Level Mathematics requirement is a prerequisite for enrollment in all mathematics courses.

### **MATH 101 Orientation to the Mathematics Major (1) (CR/NC)**

Career opportunities in the field of mathematics, designing a career goal, and a survey of departmental facilities and procedures related to research, study and graduation. Credit/No Credit grading. 1 lecture.

### **MATH 102 Agricultural Mathematics (3)**

Percentage problems in soils, dairy, horticulture, poultry, feeds, discount and interest, Pearson's square, equations, formulas, dimensional analysis, linear measurements, areas, volumes and proportions; concrete and lumber problems. 3 lectures.

### **<sup>1</sup> MATH 103 Agricultural Mathematics (3)**

Use of exponents, logarithms and trigonometric functions; basic land descriptions and measurement; mathematics of finance; basic statistics; work, horsepower and efficiency, pressure. Not open to students with credit in MATH 115, MATH 119, MATH 120 or courses for which these are prerequisites. 3 lectures. Prerequisite: Two years of high school algebra or equivalent.

### **MATH 105 Hand-Held Calculators (1)**

Operation of multi-function programmable calculators including all operations and memory and stack registers. Applications of the calculator to problems in mathematics and engineering. 1 lecture.

### **<sup>1</sup> MATH 113 Algebra (3)**

Real number system; polynomials and factoring; complex fractions; linear equations and inequalities; Cartesian coordinates and the distance formula; linear functions and their graphs; exponents and radicals; quadratic equations and functions; applications of linear and quadratic equations. Not open to students with credit in MATH 114, MATH 118, MATH 120 or courses for which these are prerequisites. 3 lectures. Prerequisite: One year of high school algebra and successful completion of the ELM requirement.

### **<sup>1</sup> MATH 114 College Algebra (3)**

**GEB B.2.**

Continuation of Math 113. Variation; systems of equations; determinants and solution of systems of equations; solution of systems of inequalities and linear programming; inverses of functions; exponential and logarithmic functions; complex numbers; the remainder and factor theorems; arithmetic and geometric series; binomial theorem; applications where suitable. Not open to students with credit in MATH 118, MATH 120 or courses for which they are prerequisites. 3 lectures. Prerequisite: MATH 113 or equivalent.

### **<sup>1</sup> MATH 115 Trigonometry (3)**

**GEB B.2.**

Trigonometric functions of acute angles and related angles; graphs, radian measure, fundamental identities, functions of two angles, applications of right and oblique triangles, and logarithmic applications. Not open to students with credit in MATH 119 or 120 or courses for which they are prerequisites. 3 lectures. Prerequisite: MATH 114 or equivalent.

### **<sup>1</sup> MATH 118 Pre-Calculus Algebra (4)**

**GEB B.2.**

Pre-calculus college algebra without trigonometry. Special products and factoring; exponents and radicals; partial fractions; fractional and quadratic equations; determinants; systems of equations; graphing; inequalities and absolute value; mathematical induction; binomial theorem; logarithms; complex numbers. Not open to students with credit in MATH 120. 4 lectures. Prerequisite: Two years of high school algebra or equivalent.

### **<sup>1</sup> MATH 119 Pre-Calculus Trigonometry (3)**

**GEB B.2.**

Rectangular and polar coordinates; trigonometric functions, fundamental identities; inverse trigonometric functions and relations; complex numbers. Not open to students with credit in MATH 115 or 120. 3 lectures. Prerequisite: MATH 118 or equivalent.

<sup>1</sup> Not open to students having a grade of C or better in MATH 141 or equivalent.

**<sup>1</sup> MATH 120 College Algebra and Trigonometry (5)****GEB B.2.**

An integrated review course in college algebra and trigonometry covering function concepts and symbols, rectangular coordinates, trigonometric functions, linear and quadratic functions, inequalities, analysis of trigonometric functions, inverse trigonometric functions, exponential and logarithmic functions, systems of equations and complex numbers. Not open to students with credit in MATH 118 or MATH 119. 5 lectures. Prerequisite: Two years of high school algebra and trigonometry; or equivalent.

**MATH 121 Finite Mathematics (3)**

Sets and counting problems. Probability theory including stochastic processes, probability distributions, and Markov Chains. Algebra of vectors and matrices, Gaussian elimination, and the inverse of a square matrix. Applications of matrices. 3 lectures. Prerequisite: MATH 118 or equivalent.

**<sup>2</sup> MATH 131, 132, 133 Technical Calculus (4) (4) (4)**

Functions, their graphs and limits; techniques and applications of differential and integral calculus; introduction to applied differential equations. Designed principally for technology students and others interested in an applied three-quarter calculus sequence. Not open to students with credit in MATH 142, MATH 143, MATH 318 (respectively) or equivalents. 4 lectures. Prerequisite: MATH 118 and MATH 119 or equivalent.

**MATH 141 Analytic Geometry and Calculus (4)**

Introduction to analytic geometry and calculus. 4 lectures. Prerequisite: MATH 118 and MATH 119 or equivalent.

**MATH 142 Analytic Geometry and Calculus (4)**

Continuation of analytic geometry and calculus. 4 lectures. Prerequisite: MATH 141.

**MATH 143 Analytic Geometry and Calculus (4)**

Continuation of analytic geometry and calculus. 4 lectures. Prerequisite: MATH 142.

**MATH 170 Theory of Equations (2)**

Properties of polynomials, rational solutions, partial fractions, complex roots, symmetric functions, numerical solutions. 2 lectures.

**MATH 201 Appreciation of Mathematics (3)**

Contemporary mathematics and the relationship between mathematics and our cultural heritage. Intended to develop an appreciation for the role that mathematics plays in society, both past and present. 3 lectures. Prerequisite: MATH 113 or equivalent.

**MATH 204 Mathematics of Matrices (3)**

Matrices, inverses, linear systems, characteristic values, applications. 3 lectures. Prerequisite: MATH 141 or consent of instructor.

**MATH 221 Calculus for Business and Economics (4)**

Polynomial calculus for optimization and marginal analysis; partial derivatives and elementary integration. Not open to students with credit in MATH 143, MATH 133 or equivalent. 4 lectures. Prerequisite: MATH 118 or equivalent.

**MATH 222 Mathematical Analysis for Economics and Business (4)**

Multivariate calculus, Lagrange multipliers; linear algebra and determinants; differential and difference equations. 4 lectures. Prerequisite: MATH 221 or equivalent.

**MATH 241 Analytic Geometry and Calculus (4)**

Continuation of analytic geometry and calculus. 4 lectures. Prerequisite: MATH 143.

**MATH 242 Differential Equations (4)**

Ordinary differential equations: introduction with applications in engineering and science; classification of equations and their analytic solutions; study of interrelationships between differential systems, graphs, and physical problems. 4 lectures. Prerequisite: MATH 241.

<sup>1</sup> Not open to students having a grade of C or better in MATH 141 or equivalent.

<sup>2</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**MATH 245 Discrete Structures (3) (Also listed as CSC 245)**

Introduction to discrete mathematical structures used in computing. Algorithms and recursion; graphs and trees; Turing machines; computability and complexity. 3 lectures. Prerequisite: CSC 118 or equivalent.

**MATH 248 Methods of Proof in Mathematics (3)**

Methods of proof (direct, contradiction, conditional, contraposition); examples from set theory; quantified statements and their negations; functions, indexed sets, set functions; proofs in analysis; proof by induction; equivalence and well-defined operations and functions; the axiomatic method. 3 lectures. Prerequisite: MATH 143.

**MATH 300 Microcomputers in Mathematics Education (2)**

Examination of existing hardware and software designed for educational uses. Mathematical topics appropriate for computer enhancement. Special methods and techniques for educational uses of computers. Emphasis on activity learning and applications. Computer as a classroom management device. 1 lecture, 1 activity. Prerequisite: At least one university-level math course and CSC 110 or CSC 410.

**MATH 304 Vector Analysis (4)**

Algebra of free vectors with applications. Differential and integral calculus of vectors. Development of theory and application of vector operations. Green's Theorem, Stokes' Theorem, and the Divergence Theorem. 4 lectures. Prerequisite: MATH 242.

**MATH 312 Linear Algebra (4)**

Vector spaces, linear transformations, linear independence, matrix algebra, linear algebraic systems, determinants, eigenvalues, eigenvectors. 4 lectures. Prerequisite: MATH 143.

**MATH 313 Linear Algebra (4)**

Bilinear and quadratic forms, unitary operators, spectral decomposition, Sylvester's Theorem, Jordan-Canonical Form, applications to other fields. 4 lectures. Prerequisite: MATH 312.

**MATH 317 Topics in Engineering Mathematics (4)**

Fourier series, Fourier transforms, discrete Fourier transforms and their properties. Probabilities concepts associated with random phenomena encountered in engineering. 4 lectures. Prerequisite: MATH 242.

**MATH 318 Advanced Engineering Mathematics (4)**

Power series solutions of differential equations and Bessel functions. Fourier series and transform; matrices. 4 lectures. Prerequisite: MATH 242.

**MATH 319 Partial Differential Equations (4)**

Mathematical formulation of physical laws. Separation of variables. Orthogonal functions and generalized Fourier series. Bessel functions, Legendre polynomials. Sturm Liouville problem. Boundary value problems; nonhomogeneous techniques. Applications to heat flow, potential theory, vibrating strings and membranes. 4 lectures. Prerequisite: MATH 318.

**MATH 320 Systems of Differential Equations (4)**

Matrix analysis, eigenvectors, eigenvalues, exponential matrix and canonical forms. Analysis of linear and nonlinear systems of differential equations: Gronwall inequality, fundamental matrix, variation of constants formula, asymptotic behavior of solutions, phase plane analysis, stability and applications to physical problems from science and engineering. 4 lectures. Prerequisite: MATH 242.

**MATH 327, 328, 329 Modern Elementary Mathematics (3) (3) (3)****328:CEB B.2.**

Development of set theory, number systems, probability and statistics and geometry. Emphasis on activity learning and applications to elementary teaching. Computer applications. MATH 327, 2 lectures, 1 activity; MATH 328, MATH 329, 3 lectures. Prerequisite: MATH 114 or equivalent.

**MATH 335 Graph Theory (3)**

Finite graphs, digraphs, Eulerian and Hamiltonian paths, matrix representation of graphs, connectedness, isomorphism, planarity, matching theory, network flow, trees, applications. 3 lectures. Prerequisite: Junior standing.



**MATH 336 Combinatorial Mathematics (3)**

Selected topics from the field of enumerative combinatorics: permutations, combinations, generating functions, recurrence relations, inclusion and exclusion, Polya theory, block design. 3 lectures. Prerequisite: MATH 143 or equivalent.

**MATH 341 Theory of Numbers (4)**

Properties of numbers. Euclid's Algorithm, greatest common divisors, diophantine equations, prime numbers, congruences, number theoretic functions, the quadratic reciprocity laws, primitive roots and indices. 4 lectures. Prerequisite: MATH 248 or consent of instructor.

**MATH 370 Putnam Exam Seminar (2)**

Directed group study of mathematical problem solving techniques. Open to undergraduate students only. Class members are expected to participate in the annual William Lowell Putnam Mathematical Competition. Course may be repeated up to eight units. 2 seminars. Prerequisite: Consent of instructor.

**<sup>2</sup> MATH 381, 382 Modern Algebra (4) (4)**

Fundamental algebraic structures and types of algebras, including operations within them and relations among them. Groups, rings and fields. 4 lectures. Prerequisite: MATH 248.

**MATH 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**✓ MATH 405 Transform Engineering Methods (3) *MUELLER***

Applications of Z-transforms to engineering problems. Clarifying and unifying concepts of Z-transforms as found in mechanical engineering, marketing, maintainability, reliability, finance, inventory control, production control, forecasting, and Poisson processes. 3 lectures. Prerequisite: MATH 242 and upper division standing.

**✓ MATH 408 Functions of a Complex Variable (4) *MUELLER***

Elementary analytic functions and mapping; Cauchy's Integral Theorem; Power series; theory of residues and evaluation of integrals; harmonic functions. 4 lectures. Prerequisite: MATH 242.

**✓ MATH 409 Complex Analysis (4) *MUELLER***

Further development of analytic function theory. Additional topics in calculus of residues, conformal mapping and the Poisson Integral. 4 lectures. Prerequisite: MATH 408.

**<sup>2</sup> MATH 412, 413, 414 Advanced Calculus (4) (3) (3)**

Introduction to concepts and methods basic to real analysis. Topics such as real number system, continuity, uniform continuity, differentiation, the integral, uniform convergence, partial differentiation, multiple integration, implicit and inverse function theorems. MATH 412, 4 lectures; MATH 413, 414, 3 lectures. Prerequisite: MATH 248.

**MATH 419 Introduction to History of Mathematics (3)**

Evolution of mathematics from earliest to modern times. Contributions of prominent mathematicians. Development of mathematical concepts and techniques. Appropriate for prospective and in-service teachers. 3 lectures. Prerequisite: MATH 143.

**MATH 424 Organizing and Teaching Mathematics (4)**

Organization, selection, presentation, application and interpretation of subject matter in mathematics. Introduction to current issues in mathematics education. For students who will be teaching in secondary schools. 4 lectures. Prerequisite: Senior standing or consent of instructor.

**✓ <sup>2</sup> MATH 431, 432 Mathematical Optimization I-II (3) (3)**

Classical optimization: max/min of functions, linear and nonlinear optimization problems, duality, constrained optimization. Model building and applications to various fields. 3 lectures. Prerequisite: CSC 219 and MATH 312 or consent of instructor.

<sup>2</sup> Each course is a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**MATH 435 Teaching Mathematics in the Elementary School (3)**

Development of mathematical concepts; the discovery or laboratory approach to learning and the role of manipulative or visual materials; teaching the mathematical rationale of fundamental operations; necessity for a sequential and organized program; the newer curricular materials and their place in the total program; problem solving; evaluation. 3 lectures. Prerequisite: ED 305 and MATH 327 or consent of instructor.

**MATH 437 Game Theory (3)**

Development of the mathematical concepts, techniques, and models used to investigate optimal strategies in competitive situations; games in extensive, normal, and characteristic form. 3 lectures. Prerequisite: MATH 312 or consent of instructor.

**<sup>2</sup> MATH 442, 443, 444 Euclidean and Modern Geometries (3) (3) (3)**

Foundations of Euclidean geometry. Introduction to finite geometries, non-Euclidean geometry, projective geometry, and geometric transformations. Appropriate for prospective and in-service mathematics teachers. 3 lectures. Prerequisite: MATH 248.

**MATH 459 Undergraduate Seminar (2)**

Reports and discussions by students, through seminar format, on topics in mathematics education, applied mathematics, or finite mathematics. 2 seminars. Prerequisite: Two of the following: MATH 242, MATH 312, MATH 381.

**<sup>2</sup> MATH 461, 462 Senior Project (3) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: MATH 459.

**MATH 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**MATH 505 Foundations of Mathematics (4)**

Development of the primitive materials and concepts necessary to an understanding of the axiomatic method dealing with sets and logic. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**MATH 506 Topics in Modern Algebra (4)**

Topics selected from group theory, ring theory, unique factorization, group representation, module theory and linear algebra. 4 seminars. Prerequisite: MATH 382 and MATH 312 or equivalent and graduate standing.

**MATH 507 Structure of Geometry (4)**

Transformations and geometries; affine, topological and analytic. Appropriate for the prospective or in-service teacher. 4 seminars. Prerequisite: Graduate standing or consent of instructor; MATH 442 recommended.

**MATH 508 Introduction to Topology (4)**

Basic ideas of general topology, metric spaces, homeomorphisms and the separation axioms. 4 seminars. Prerequisite: MATH 412 and graduate standing or consent of instructor.

**MATH 510 Survey of Modern Mathematics (4)**

Selected topics from the field of modern mathematics: projective, and synthetic geometry, topology, logic, matrices, vectors, theory of games, probability, linear and modern algebra and convex sets, Boolean algebras, graph theory, Lattice theory, geometry of complex numbers. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**<sup>2</sup> MATH 512, 513 Partial Differential Equations of Physical Systems (4) (4)**

Partial differential equations of first and second order. Laplace's equation, wave equation, diffusion equation and others; methods for their analytical solution. 4 seminars. Prerequisite: MATH 318 and graduate standing or consent of instructor.

<sup>2</sup> Each course in a combined listing of sequentially numbered courses is a prerequisite to its successor in the same listing.

**MATH 515 Real Analysis (4)**

Introduction to Lebesgue measure and integration, convergence theorems,  $L_1$  spaces, Radon-Nikodym theorem and Fubini's theorem. 4 seminars. Prerequisite: MATH 413 and MATH 508 or consent of instructor.

**MATH 516 Linear Operators (4)**

Linear spaces, operator theory and operational calculus. Applications to differential equations, integral equations, transforms and Fourier analysis. 4 seminars. Prerequisite: MATH 515 and graduate standing or consent of instructor.

**MATH 518 Advanced Ordinary Differential Equations (4)**

Existence, continuation and dependence on parameters of solutions. Linear systems, initial and boundary value problems. Self-adjoint eigenvalue problems. 4 seminars. Prerequisite: MATH 318 and graduate standing or consent of instructor.

**MATH 519 Topics in History of Mathematics (4)**

Selected topics in the development of concepts and techniques in mathematics from earliest times to the present. May be repeated up to a total credit of 8 units. 4 seminars. Prerequisite: Graduate standing or consent of instructor.

**MATH 580 Seminar (1-4)**

Built around topics in advanced mathematics chosen according to the common interests and needs of the students enrolled. Each seminar will have a subtitle according to the nature of the content. 1 to 4 seminars. Total credit limited to 12 units. Prerequisite: Graduate standing and consent of instructor.

**MATH 596 Thesis (3) (3)**

Serious research endeavor devoted to the development, pedagogy or learning of mathematics. Prerequisite: Graduate standing and consent of instructor.

**ME—MECHANICAL ENGINEERING****ME 134 Mechanical Systems (3)**

Analysis, synthesis, and testing of mechanical systems, their components and instruments. 2 lectures, 1 laboratory.

**ME 136 Thermal Systems (3)**

Analysis and synthesis of thermal systems, their components and instruments. 2 lectures, 1 laboratory.

**ME 211 Engineering Statics (3)**

Analysis of forces on engineering structures in equilibrium. Properties of forces, moments, couples, and resultants. Equilibrium conditions, friction, centroids, area moments of inertia. Introduction to mathematical modeling and problem solving. Vector mathematics where appropriate. 3 lectures. Prerequisite: MATH 241 (or concurrently), PHYS 131.

**ME 212 Engineering Dynamics (4)**

Analysis of motions of particles and rigid bodies encountered in engineering. Velocity, acceleration, relative motion, work, energy, impulse, and momentum. Further development of mathematical modeling and problem solving. Vector mathematics where appropriate. 4 lectures. Prerequisite: MATH 241, ME 211.

**ME 221 Solar Energy (3)****GEB F.2.**

Methods of utilizing solar energy. Energy concepts. Collection and storage systems; greenhouse effect. Commercial and residential building applications. Solar power generation; measurements; recent technical developments and literature. 3 lectures. Prerequisite: PHYS 121, PHYS 122, PHYS 123 or equivalent.

**ME 240 Additional Engineering Laboratory (1) (CR/NC)**

Special assignments undertaken by students who need or wish to acquire abilities supplementary to their standard pattern of courses. Assignments must be primarily of shop or laboratory nature. Work is done by the student with a minimum of faculty supervision. Credit/No Credit grading only. 1 laboratory. Prerequisite: Consent of department head.

**ME 302 Thermodynamics I (3)**

Properties and fundamental relations for processes involving gases and vapors. First and second laws of thermodynamics. 3 lectures. Prerequisite: PHYS 132, MATH 143, CHEM 122 or CHEM 125, ENGR 251 or equivalent.

**ME 303 Thermodynamics II (3)**

Power and refrigeration cycles. Property relations for real gases. Mixtures of gases and vapors, psychrometry combustion. 3 lectures. Prerequisite: ME 302, ENGR 251.

**ME 313 Heat Transfer (3)**

Basic principles of heat transfer. Radiation, conduction and convection in gasses and liquids during forced and gravity flow conditions, behavior of heat exchangers. 3 lectures. Prerequisite: ME 302 or CHEM 305, MATH 242, ENGR 251 or equivalent.

**ME 316 Mechanical Vibrations (3)**

Free vibration, damping, transient and steady state response to forced vibrations. Engineering methods, single and multiple degrees of freedom. 3 lectures. Prerequisite: MATH 318, ME 212, ENGR 251 or equivalent.

**ME 317 Vibrations Laboratory (1)**

Experimental studies of the dynamic behavior of structures and machines. Instrumentation methods utilized in field and laboratory. Analog techniques. 1 laboratory. Concurrent: ME 316 or consent of instructor. Prerequisite: EE 201, ME 136 or equivalent.

**ME 322 Solar Energy Engineering (3)**

Radiation measurement and estimation at earth's surface. Radiation properties of opaque and transparent materials. Flat plate and focusing collectors. Energy storage. Heating and cooling of buildings. Solar power and distillation. 3 lectures. Prerequisite: ENGR 251 or equivalent, ENVE 221, ENVE 313, ME 302 or CHEM 305. Concurrent: ME 341.

**ME 324 Kinematics (4)**

Motion in machine parts. Displacements, velocities, and accelerations in linkage, cams, gears, and other mechanisms using computer analysis. 2 lectures, 2 two-hour laboratories. Prerequisite: ETME 141 or ETME 143, ME 212, ENGR 251 or equivalent.

**ME 327 Introduction to Design (5)**

Design of machine parts by stress and deflection. Effects of fluctuating stresses and stress concentration. Design of threaded fasteners, power screws, springs, shaft and other machine parts. Modern industrial design practice using standard components and design layout drawings. 4 lectures, 1 laboratory. Prerequisite: CE 204, CE 205 (or concurrent), ETME 143, MET 306, ENGR 251.

**ME 341, 342 Fluid Mechanics (3) (3)**

Fluid statics. Conservation equations of fluid dynamics. Viscous flow, boundary layer concepts, lift and drag, compressible flow, turbomachinery. ME 341: 3 lectures. Prerequisite: ME 212. ME 342: 3 lectures. Prerequisite: ME 341, ENGR 251.

**ME 343 Thermodynamics Laboratory (1)**

Experimental methods applied to the evaluation of machine performance, processes and verification of theory. Thermodynamic processes, heat transfer characteristics, and combustion phenomena. Planning experiments, interpretation of results, preparation of reports. 1 laboratory. Prerequisite: ME 136, ME 303, ME 313.

**ME 345 Fluid Mechanics Laboratory (1)**

Fluid mechanics experiments in pipe flow, flow measurement, turbomachinery, lift and drag, nozzle flow, and applications of the conservation equations of fluid mechanics. 1 laboratory. Prerequisite: ME 136, ME 342.

**ME 350 Thermal Environmental Engineering (4)**

Physiological aspects of the thermal environment, heating and cooling loads, moist air properties and psychrometric processes, combined heat and mass transfer processes. 4 lectures. Prerequisite: ME 302, ME 313.

**ME 351 Active Solar System Analysis and Design (4)**

Insolation estimation at earth's surface. Radiation properties of opaque and transparent materials. Solar collector analysis. Energy storage. Active system simulation and design. Applications to building environmental control and process heat. 4 lectures. Prerequisite: ME 313, ME 341, ENGR 251.

**ME 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**ME 401 Stress Analysis (4)**

Advanced strength of materials: behavior of disks, plates, and shells. Theory of elasticity. Energy methods. 3 lectures, 1 laboratory. Prerequisite: Junior standing and CE 205, CE 206, ENGR 251, MATH 318.

**ME 412 Composite Materials Analysis and Design (4)**

Behavior of unidirectional fiber composites. Properties of short-fiber composites, and orthotropic lamina. Analysis of laminated composites. Strength and hygrothermal behavior of composite materials. Structural optimization. Bending, buckling and vibration of laminated plates. Fracture mechanics of composite structures. 3 lectures, 1 laboratory. Prerequisite: AERO 324 or ME 327.

**ME 415 Energy Conversion (4)**

Engineering aspects of energy source, conversion and storage, including an energy system design project. 4 lectures. Prerequisite: ME 302.

**ME 422 Mechanical Control Systems (4)**

Analytical modeling and compensation of mechanical control systems. Design of mechanical, hydraulic and fluid systems using analog and digital simulation techniques. 3 lectures, 1 laboratory. Prerequisite: ME 316, ME 317.

**ME 424, 425 Design of Piping Systems (4) (4)**

Functions, requirements, and design of piping systems, including safety and economic considerations for power, chemical, and process plants. Welding and other forms of joint construction, materials specifications, sizing, layout, flexibility, support, insulation, and cost estimation of water, steam, air, gas, and corrosive and viscous fluid systems. Philosophy, background, and requirements of principal governing National Codes. 3 lectures, 1 laboratory. Prerequisite: CE 205, CE 206, ME 342, ENGR 251.

**ME 428 Design (4)**

Basic design techniques such as brainstorming, feasibility studies, models, case studies, design decisions and compromises. Industrial participation design program. 2 lectures, 2 laboratories. Prerequisite: ME 324, ME 327, ENGR 251.

**ME 431 Mechanical Design Technique (4)**

Comprehensive study of various design methods and techniques. Optimization techniques used to explore various structural concepts such as prestressing, statistical screening, decision modeling. Simulation of systems using digital computer. Design criteria identification of design parameters and constraints. 3 lectures, 1 laboratory. Prerequisite: ME 316, ME 327.

**ME 432 Petroleum Reservoir Engineering (4)**

Types of reservoirs and reservoir rocks. Measurement and interpretation of physical properties of reservoir rocks and fluids porosity, permeability, compressibility, electrical resistivity, fluid saturation, viscosity, solution gas. Introduction to flow in porous media and well logging. 3 lectures, 1 laboratory. Prerequisite: ME 341.

**ME 434 Petroleum Recovery Methods (4)**

Primary, secondary, and tertiary (enhanced) oil recovery methods. Material balance calculations, waterflooding, gas injection, steam injection, in-situ combustion, chemical flooding. Performance calculations. 4 lectures. Prerequisite: ME 342.

**ME 435 Petroleum Production Development (4)**

Theory and practice of oilwell planning, drilling and completion applied to the development of new oil production. Planning and operation of offshore deep water drilling systems. 4 lectures. Prerequisite: ME 327, ME 342.

**ME 436 Petroleum Production Surface Operation (4)**

Design, operation and maintenance of surface equipment required in oil production. Processes and systems involved are well pumping, fluid gathering and storage, separation of oil, gas, water and sediment from produced fluid. Includes equipment used in processes of water flood, steam stimulation and in situ combustion. 4 lectures. Prerequisite: ME 342.

**ME 438 Heat Exchanger Design (4)**

Theory and application of numerical, analytical, and experimental methods to selected heat transfer problems. Application of principles of conduction, convection, condensation, and boiling heat transfer, stress, and vibrations to design of heat exchange equipment. 4 lectures. Prerequisite: ME 303, ME 313, ME 342, ENGR 251.

**ME 440 Thermal System Design (3)**

Techniques used to design thermal systems. Economic considerations, mathematical modeling, and simple optimization techniques in performance analysis of thermal systems. 2 lectures, 1 laboratory. Prerequisite: ME 303, ME 313, ME 342, IE 314 and ENGR 251.

**ME 443 Turbomachinery (4)**

Performance characteristics. Two-dimensional cascades. Axial flow turbines. Axial flow compressors, pumps and fans. Three-dimensional flows in axial turbomachines. Centrifugal pumps, fans and compressors. 4 lectures. Prerequisite: ME 303, ME 342, MATH 318.

**ME 444 Combustion Engine Design (4)**

Application of design parameters to the various engine cycles. Aspects of the combustion processes. Energy conversion including losses and cooling. Static and dynamic loading. 3 lectures, 1 laboratory. Prerequisite: ME 303.

**ME 445 Convective Heat and Mass Transfer (4)**

Forced convection in laminar and turbulent flow, free convection, diffusion, combined heat and mass transfer. 4 lectures. Prerequisite: ME 313, ME 341.

**ME 450 Solar Power Systems (4)**

Recommend as complement to ME 415. High and intermediate temperature systems for conversion of solar energy to mechanical power and heat. Thermal energy storage and total thermal energy system design. 3 lectures, 1 laboratory. Prerequisite: ME 302, ME 313.

**ME 451 Passive Solar System Analysis and Design (3)**

Performance analysis of passive systems applied to building environmental control. Dynamics of massive thermal systems. Simulation and correlation techniques in system design. Use of packaged CAD programs. 3 lectures. Prerequisite: ME 351.

**ME 452 Solar Engineering Design (2)**

Project work in designing active and passive thermal environmental control and industrial process heating and cooling systems. Selected system designs involving case and feasibility studies, component selection, economic and performance analysis and design drawings. 1 lecture, 1 laboratory. Prerequisite: ME 351.

**ME 455 Thermal Environmental Experimentation (2)**

Experimental determination of the performance of various thermal and solar devices including a direct expansion coil, refrigeration compressor, ventilation fan, a liquid cooled solar collector and an air cooled solar collector. Report writing, error analysis and statistical interpretation of experimental data. 1 lecture, 1 laboratory. Prerequisite: ME 303, ME 351.

**ME 456, 457, 458 HVAC System Design (3) (3) (3)**

Individual and team project work (including computer simulation) in designing systems, selecting equipment, estimating energy consumption and operating cost for applications in: ME 456, industrial ventilation, exhaust and pollution control; ME 457, commercial and industrial refrigeration; ME 458, commercial and industrial heating and air conditioning. 1 lecture, 2 laboratories. Prerequisite: ME 341, ME 350, EE 201.

**ME 459 Advanced Thermal Environmental System Design (3)**

Refrigeration cycles, systems and equipment; energy requirements and operating cost; design parameters for air conditioning and low temperature applications. Heat conservation and recovery strategies. 2 lectures, 1 laboratory. Prerequisite: ME 303, ME 350, EE 201.

**ME 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: Senior standing.

**ME 463 Undergraduate Seminar (2)**

New developments, policies, practices, and procedures discussed through regular seminar. Each individual responsible for the development and presentation of a topic in the chosen field. 2 seminars. Prerequisite: Senior standing.

**ME 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**ME 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**ME 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser and supervising faculty member.

**ME 502 Stress Analysis (4)**

Approximate methods of stress analysis. Energy methods, applications to one- and two-dimensional stress fields. 3 lectures, 1 laboratory. Prerequisite: ME 401, graduate standing or consent of instructor.

**ME 517 Advanced Vibrations (4)**

Vibration of complex engineering systems. Inertia and stiffness matrices. Natural frequencies and normal modes. Approximate solutions and computer techniques. Response to transient and periodic inputs. 3 lectures, 1 laboratory. Prerequisite: ME 316, ENGR 251, graduate standing or consent of instructor.

**ME 526 Dynamics of Mechanical Systems (4)**

Analysis of dynamic problems in machine design. 3 lectures and 1 two-hour activity. Prerequisite: ME 316, ME 324, and graduate standing or consent of instructor.

**ME 541 Advanced Thermodynamics (4)**

Selected modern applications of thermodynamics which may include topics from: 1) Equilibrium and kinetics as applied to combustion and air pollution. Analysis and evaluation of techniques used to predict properties of gases and liquids. Energy reduction techniques for industrial and commercial operations. 2) Improvement of modern thermodynamic cycles by second law analysis. 4 lectures. Prerequisite: ME 303, ENGR 251, and graduate standing or consent of instructor.

**ME 542 Dynamics and Thermodynamics of Compressible Flow (4)**

Control volume analysis of fluid-thermo equations for one-dimensional, compressible flow involving area change, normal shocks, friction, and heat transfer. Two-dimensional supersonic flow including linearization, method of characteristics, and oblique shocks. One-dimensional constant area, unsteady flow, 4 lectures. Prerequisite: MATH 242, ME 303, ME 342, and graduate standing or consent of instructor.

**ME 550 Kinematic Analysis and Design (3)**

Analysis and design of mechanical linkages by means of geometric and algebraic methods. Optimization studies. 3 seminars. Prerequisite: ME 324 and graduate standing or consent of instructor.

**ME 551 Mechanical Systems Analysis (4)**

Various system modeling methods applied to mechanical systems. System stability studies and system optimization methods. 3 seminars, 1 laboratory. Prerequisite: Graduate standing or consent of instructor.

**ME 552 Conductive Heat Transfer (3)**

Theory of steady-state and transient conduction in isotropic and anisotropic media. Development of differential equations, solutions by series, conformal mapping, transforms, finite differences. Concentrated and distributed heat sources. 3 seminars. Prerequisite: ME 303, ME 313, ME 342, MATH 318, and graduate standing or consent of instructor.

**ME 553 Convective Heat Transfer (3)**

Analysis of convective transfer of energy, mass and momentum. High speed flow and ablation. Phase change heat transfer. 3 seminars. Prerequisite ME 313, ME 342, MATH 318, and graduate standing or consent of instructor.

**ME 556 Stability of Structural Systems (3)**

Static and dynamic analysis of structural and mechanical systems, stability analysis by solution of differential equations, energy methods, perturbation methods. Buckling of columns, torsional buckling, dynamic buckling. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**ME 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

**MET—METALLURGICAL ENGINEERING****MET 121 Introduction to Metallurgical Engineering (1)**

Introduction to the profession of metallurgical engineering through the use of films, lectures, and guest appearances by practicing metallurgical engineers. 1 lecture.

**MET 122 Introduction to Metallurgical Engineering Laboratory (1)**

Introduction to metallurgical engineering laboratory practices through the use of laboratory equipment during the evaluation of metallic material properties. 1 laboratory. Prerequisite: MET 121.

**MET 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**MET 222 Physical Metallurgy (4)**

Introduction to physical metallurgy of major ferrous alloy systems. Crystal structure and bonding, equilibrium diagrams, phase transformations, ITT diagrams, hardenability and heat treatment. Steel mill, foundry and welding metallurgy. Metallurgical laboratory practices, mechanical testing, metallurgical calculations and engineering reports. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: MET 235 or MET 306 or consent of instructor.



**MET 223 Physical Metallurgy (3)**

Introduction to the physical metallurgy of major nonferrous alloy systems, copper, aluminum, nickel, cobalt and titanium, extractive and refining metallurgy, casting, joining metallurgy, strengthening mechanisms, mechanical properties, mechanical working and recrystallization, corrosion resistance. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: MET 222.

**MET 235 Metallurgy for Engineering Technology (4)**

Physical and mechanical properties of metals and alloys. Selection, heat treatment, and use of metals and alloys. Steel, cast iron, stainless steel, and nonferrous alloys. Fabrication problems and their solution. 3 lectures, 1 laboratory. Prerequisite: CHEM 121 and sophomore standing in Engineering Technology.

**MET 301 Physical Properties of Materials (3)**

Solid state theory of materials as pertaining to crystallography, internal energy, interatomic bonding, specific heat, thermal expansion, thermal conductivity, electrical conductivity, semiconductors, magnetism, temperature effects and diffusion. 3 lectures. Prerequisite: MET 306, MATH 241, PHYS 133, ME 211, CHEM 125 or consent of instructor.

**MET 302, 303 Mechanical Metallurgy (4) (4)**

Uniaxial and complex static stress, stress strain elastic and plastic relationships, mechanical property tests, mechanisms of plastic deformation, dislocation theory, strengthening mechanisms, fracture; brittle, ductile and high temperature, fatigue, creep, stress-rupture, strain rate effects, environmental effects. 3 lectures, 1 laboratory. Prerequisite: MET 301, ENGR 251 or equivalent, CE 204, CE 205, CE 206 or consent of instructor.

**MET 306 Materials Engineering (3)**

Structure of matter. Physical and mechanical properties of materials including metals, alloys, ceramics, insulating materials, semiconductors and polymers. Equilibrium diagrams. Heat treatments, material selection and corrosion phenomena. 3 lectures. Prerequisite: Sophomore standing in major, PHYS 131, CHEM 125 or consent of instructor.

**MET 324, 325, 326 Metallurgical Engineering (4) (4) (4)**

Effect of alloying elements in steel. Heat treatment, atmosphere furnaces, bright annealing, carbon restoration. Failure analysis and prevention, advanced metallography including electron microscopy. Theory and application of nondestructive examination. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: MET 223, ENGR 251 or equivalent.

**MET 341 Materials Engineering Laboratory (1)**

Laboratory experiments with materials. Heat treating of steel and aluminum alloys and mechanical evaluation. Identification of microstructures, corrosion testing, cold working and annealing, cooling curves and impact testing. 1 laboratory. Prerequisite or concurrent: MET 306.

**MET 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**MET 421, 422, 423 Metallurgical Thermodynamics (4) (4) (4)**

Physical chemistry of metals, thermodynamics of liquid and solid metallic systems, metallurgical kinetics, mass and energy balances in high temperature metallurgical reactions, steelmaking, solidification, diffusion theory, recovery, recrystallization and grain growth, solid state transformations, computer applications. 4 lectures. Prerequisite: CHEM 306, MET 303, and MET 326 or consent of instructor.

**MET 424, 425, 426 Applied Metallurgical Engineering (3) (3) (3)**

Fracture mechanics, fatigue, environment assisted cracking, galvanic corrosion, corrosion testing, corrosion control. X-ray diffraction, nonmetallic systems, computer applications. 2 lectures, 1 laboratory. Prerequisite: MET 303, MET 326, CHEM 306.

**MET 434 Welding Engineering (3)**

Weldability studies of high strength, low alloy steels and the important metallurgical aspects of welded fabrication. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: MET 306 and senior standing in Metallurgical or Mechanical Engineering.

**MET 435 Welding Engineering (3)**

Principles of welded pressure vessel design and fabrication in accordance with governing codes. Material selection, process selection, procedure. Performance qualifications of pressure vessels; cost estimating. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: MET 434.

**MET 436 Welding Engineering (3)**

Weldability and metallurgical studies of aluminum and aluminum alloys, stainless and heat resisting steels, and titanium and titanium alloys. Principles of process selection. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories. Prerequisite: MET 435.

**MET 440 Failure Analysis Laboratory (1)**

Actual laboratory analysis of a failed metal part, report preparation and oral presentation. 1 laboratory. Prerequisite: MET 326.

**MET 441, 442, 443 Metallurgy of Complex Alloys Laboratory (1) (1) (1)**

Laboratory examination of properties and microstructure—optical and SEM, of superalloys, stainless steels, titanium alloys, tool steels, dual phase steels. Miscellaneous course fee required—see *Class Schedule*. 1 laboratory. Prerequisite: MET 303, MET 326.

**MET 461, 462 Senior Project (2) (3)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time.

**MET 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Prerequisite: Consent of department head, graduate adviser, or supervising faculty member.

**MET 562 Mechanical Metallurgy (3)**

Analysis of stress and strain in solids; elements of theory of elasticity and plasticity, and their applications to metal forming. Residual stresses, theory of dislocations, theory of recrystallization, effects of temperature and rate of loading; fracture mechanics, fatigue and creep. 3 seminars. Prerequisite: MET 306, graduate standing, or consent of instructor.

**MET 564 Fracture Mechanics and Stress Corrosion Cracking (3)**

Stress analysis of cracks, energy analysis of fracture process, fracture toughness testing, fail safe design, the use of fracture mechanics in describing fatigue and stress corrosion cracking. 2 seminars, 1 laboratory. Prerequisite: MET 306, CE 205, CE 206, and graduate standing or consent of instructor.

**MET 599 Design Project (Thesis) (2) (2) (5)**

Each individual or group will be assigned a project for solution under faculty supervision as a requirement for the master's degree, culminating in a written report/thesis. Prerequisite: Graduate standing.

**MGT—MANAGEMENT****MGT 118 Introduction to Human Relations in Business (3)**

Small group dynamics, leadership, communication, motivation, and perception. The individual in the business organization. For nonbusiness majors. 3 lectures.

**MGT 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**MGT 201 Principles of Management (3)**

Management process involving organization, decision-making, and managerial activities fundamental to all management levels and functional areas. Application to business firms, governmental agencies, hospitals, benevolent groups, and colleges. 3 lectures. For nonbusiness majors.

**MGT 206 Principles of Purchasing (3)**

Purchasing function applied to manufacturing, retailing, and food-service institutions. Its interdependence with other functional areas of the organization. 3 lectures. For nonbusiness majors.

**MGT 306 Purchasing Management (4)**

Role and scope of the procurement function and concept of an integrated materials management process. Relations with functional departments. Purchasing structure and processes in business and service organizations. Global concept of international purchasing. Measuring purchasing performance. 4 lectures. Prerequisite: Junior standing.

**MGT 310 The Labor Movement in the United States (4)**

Labor movement theories, American trade union development, union management, labor and economic political power, variations in labor movements. Union issues in private and public sectors. 4 lectures. Prerequisite: Junior standing.

**MGT 311 Industrial Management (4)**

Organization and functioning of management in industry. Planning, direction, and control of the business enterprise in terms of policy formation, organizational structure, finance, sales, procurement, plant location, facilities and production processes. 4 lectures. Prerequisite: Junior standing.

**MGT 312 Organization and Management Theory (4)**

Examination of the structural and configurational components of formal organizations. Analysis of management theory development, concepts of organizational processes and managerial strategies. Application of organizational and management imperatives to formal organizational structures and functions. 4 lectures. Prerequisite: Junior standing.

**MGT 313 Industrial Relations (3)**

Functions of personnel and labor relations as they relate to the management of the human resources in the organization. Industrial relations theory and practice. For nonbusiness majors only. 3 lectures. Prerequisite: Junior standing.

**MGT 314 Human Resources Management (4)**

Personnel function as it relates to the management of the human resources of the organization. Survey of employee/employer relations, the work environment, employee development and labor relations. 4 lectures. Prerequisite: Junior standing.

**MGT 316 Labor Contract Negotiation and Administration (4)**

Collective bargaining and resolution of disputes between employees, unions, and employers. Simulation of bargaining and grievance processes. Contract development and arbitration. 4 lectures. Prerequisite: Junior standing.

**MGT 317 Organizational Behavior (4)**

Application of behavioral science concepts to management. Motivation, perception, communications, leadership style, group dynamics. Effectiveness: individual, interpersonal, team, intergroup and organizational. 4 lectures. Prerequisite: Junior standing.

**MGT 318 Modeling Systems (4)**

Model formulation and solution procedures. Structured and unstructured processes. Constructing models under uncertainty. Probabilistic processes in management planning. Tradeoffs in alternative courses of action. Deterministic and probabilistic models. Mathematical techniques in strategic planning. Game theory. Optimization and suboptimization in business models. 4 lectures. Prerequisite: Junior standing, STAT 252 or equivalent.

**MGT 321 Management Information Systems (4)**

Application of computer and quantitative techniques in business and industry. File processing, data bases, management information systems. Data communication and distributed data processing. System development process and information resource management. Description of quantitative methods in business. Relationships of the computer to the decision-making process. 3 lectures, 1 laboratory. Prerequisite: CSC 120 and junior standing.

**MGT 322 Information Systems Analysis (4)**

Characteristics of a management information system. Evaluation and justification for an information system. Data base and management information systems. Management decision-making process and decision support systems. 4 lectures. Prerequisite: MGT 321, MGT 325, or consent of instructor. CSC 345 is recommended.

**MGT 323 Simulation of Management Decision Making (4)**

Simulation of business problems for management decision making. Types of business simulators. Use of the computer in simulation. Interaction of the information system and the simulation concept. Business applications and solutions of cases. 4 lectures. Prerequisite: MGT 321 or consent of instructor.

**MGT 325 Production and Operations Management (4)**

Introduction to operations management and production systems; production models. Planning and control in manufacturing. Quantitative methods and statistical techniques used in production systems management. 3 lectures, 1 laboratory. Prerequisite: MATH 221, STAT 252 and junior standing.

**MGT 331 Organization Design and Analysis (4)**

Organizational design strategies and constructs, environmental, technological, and behavioral imperatives influencing organizational objectives and structures; design modifications to accommodate industrial, governmental, and nonprofit organizational requirements. Diagnostic analysis approaches; causation analysis; alternative formulation and analysis; design optimization criteria and techniques. 4 lectures. Prerequisite: MGT 312 or consent of instructor.

**MGT 332 International Business Management (4)**

Organization and operation of foreign business and multinational firms. Case studies dealing with differing cultural backgrounds, national interests, and economic pressures. 4 lectures. Prerequisite: MGT 312 and junior standing.

**MGT 341 Planning and Decision Theory (4)**

Development of a theory of planning. Process of planning, role of participants in planning, the auxiliary functions. Integration into a general theory of decision making, with behavioral and quantitative aspects. 4 lectures. Prerequisite: MGT 312, MGT 325, or consent of instructor.

**MGT 400 Special Problems for Advanced Undergraduates (1-4)**

Individual investigation, research studies, or surveys of selected problems. Total credit limited to 4 units. Prerequisite: Senior standing and consent of instructor.

**MGT 410 Compensation (4)**

Management of compensation systems. Wage, salary, and benefit administration. Job analysis, description, and evaluation. Incentive, insurance, leave, pensions, and sharing plans. Wage, hour, and benefit legislation. 4 lectures. Prerequisite: MGT 314 or consent of instructor.

**MGT 413 Labor Law (4)**

Federal and state labor policy as expressed in common law, relevant statutes, and executive orders. Effects upon labor, management, minorities, and the public. Current rules analyzed in a contemporary and historical context. Understanding important industrial relations and manpower problems. 4 lectures. Prerequisite: MGT 310 or consent of instructor.

**MGT 414 Business Strategy and Policy Seminar (4)**

Application of interdisciplinary skills to comprehensive short and long range strategy and policy formulation. Analysis of the interdependence between external environments and internal systems. Case studies from a general management point of view. Industry and company simulations. Group problem solving. Integrating course of the core curriculum. 4 seminars. Prerequisite: All 300-level Business core courses and senior standing.

**MGT 415 Advanced Personnel Management (4)**

Managerial functions related to the procurement, development, maintenance, and utilization of people in the work environment. 4 lectures. Prerequisite: MGT 314, or consent of instructor.

**MGT 417 Organization Development (4)**

Analysis of development and trends in the field of organization development. Application of behavioral science knowledge and social technology to growth and change of organizations for the purpose of improving effectiveness. Problem diagnosis and facilitation skills. 4 seminars. Prerequisite: MGT 317 or consent of instructor.

**MGT 418 Advanced Quantitative Methods and Controls in Business (3)**

Quantitative controls as applied to the operations of business. For the senior student who needs operational knowledge for application in business analysis and decision. 3 lectures. Prerequisite: MGT 318, MGT 325, and senior standing or consent of instructor.

**MGT 422 Information Systems Design and Implementation (4)**

Structured analysis and design for organizational information requirements. File and data base specifications. Distributed data base concepts. Input, output, and procedure controls. File security and cryptography. Hardware and software selection. Project management and control. Decision support systems. System implementation and audit. Management of data processing operations. 4 lectures. Prerequisite: MGT 322, MGT 323, CSC 446.

**MGT 430 Internship (2-8) (CR/NC)**

Business internship to permit student to correlate experience and academic knowledge. Placement in a part-time, supervised work experience program in a government agency or private organization (entrepreneurship, partnership or corporation) as approved by the department head. The intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. Sixteen hours of work experience per academic quarter per two units of credit. Maximum of eight units per quarter. Credit/No Credit grading only. Prerequisite: Junior standing.

**MGT 445 Advanced Operations Management (4)**

Advanced principles in operations management as applied to both manufacturing and service organizations. Topics include: product-service conversion systems, capacity planning and utilization, aggregate planning, scheduling and control, inventory management, and operations subsystem coordination with the organization's strategy. 4 lectures. Prerequisite: MGT 318, MGT 322, MGT 325, and senior standing.

**MGT 461, 462 Senior Project (2) (2)**

Selection and analysis of a problem under faculty supervision. Problems typical of those which graduates must solve in their fields of employment. Formal report is required. Minimum 120 hours total time. Prerequisite: MGT 461 for MGT 462.

**MGT 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

**MGT 488 Small Business Management (4)**

Application of management knowledge and skills to the specific managerial problems involved in planning and operating the smaller company; growth strategies; the art of securing performance; changing the organization structure to match growth; recruiting and compensating new personnel. 4 seminars. Prerequisite: Senior standing.

**MGT 489 Analysis of International and Multinational Organizations (4)**

Integration of theoretical and applied managerial concepts, strategies, and organizational practices in: international and multinational organizations; administration of foreign operations; conflicts between domestic and international policies and practices; integration of cultural, technological, and organizational management imperatives in multinational and international operations. 4 lectures. Prerequisite: MGT 332 or consent of instructor.

**MGT 500 Independent Study (1-4)**

Advanced study planned and completed under the direction of a departmental faculty member. Open only to graduate students demonstrating ability to do independent work. Prerequisite: Formal petition with approval.

**MKTG—MARKETING****MKTG 204 Elements of Marketing (4)**

Overview of the marketing institutions and function of marketing in the economic, socio-cultural and political-legal environments. 4 lectures. Prerequisite: ECON 201 or ECON 221 or equivalent, or consent of instructor. Not acceptable for credit toward Business Administration degree.

**MKTG 301 Principles of Marketing (4)**

Basic course in marketing that examines marketing's role in society and management of the product, promotion, pricing and channel strategies of the firm. 4 lectures. Prerequisite: ECON 222, and junior class standing.

**MKTG 302 Marketing Information and Analysis (4)**

Analysis of target markets, estimating market potential, identifying secondary and primary information sources, and forecasting sales. 4 lectures. Prerequisite: MKTG 301 and all lower division course requirements.

**MKTG 303 Buyer Behavior (4)**

Applied study of behavior that affects marketing decisions in both consumer and industrial markets. 4 lectures. Prerequisite: MKTG 302.

**MKTG 304 Channels and Physical Distribution (4)**

Selection, evaluation and control of channels of distribution and management of physical distribution. 4 lectures. Prerequisite: MKTG 302.

**MKTG 305 Promotion Strategies (4)**

Designing the promotion strategies of the firm, including advertising, personal selling, sales promotion, publicity and public relations. Communications media available; their uses and limitations. 4 lectures. Prerequisite: MKTG 302.

**MKTG 401 International Marketing (4)**

Marketing activities necessary to direct the flow of a company's goods and services to customers in global markets. 4 lectures. Prerequisite: MKTG 302 and senior standing.

**MKTG 405 Sales Management (4)**

Management of the field sales force, including staffing, training, directing, evaluating and control of sales personnel. 4 lectures. Prerequisite: MKTG 302 and senior standing.

**MKTG 406 Marketing Management (4)**

Policymaking and decisionmaking applications in the planning, organizing, operating, controlling and evaluating of individual products and brands. 4 lectures. Prerequisite: MKTG 302 or consent of instructor.

**MKTG 412 Marketing Law (4)**

Law of marketing from a comprehensive management perspective: products, channels, pricing, promotion and credit. Information on patents, copyrights and trademarks. 4 lectures including case analysis. Prerequisite: Senior or graduate standing, BUS 207 and BUS 404 recommended.

**MKTG 450 Direct Marketing (4)**

Direct response marketing including the use of mail, space advertising, radio and television media in marketing products and services to consumer and industrial markets. 4 seminars. Prerequisite: MKTG 302 and senior standing.

**MKTG 466 Marketing Problems Seminar (4)**

Application of modern methods to the exploration and analysis of current and potential marketing trends, opportunities, and problems. 4 seminars. Prerequisite: Senior standing, MKTG 406 or consent of instructor.

**MKTG 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**MSC—MILITARY SCIENCE****MSC 111 Current Military Affairs (2)**

Organization and functions of the Department of Defense. Issues related to U.S. military affairs: selective service, arms control, nuclear weapons and alliances. Purpose of ROTC; military customs; and the military as a profession. 2 lectures.

**MSC 112 Survival Training I (2) (CR/NC)**

Techniques of survival in a wilderness environment. Major emphasis on acquiring, preparing and consuming plant and animal food and first aid procedures. Open to all students. Credit/No Credit grading. 1 lecture, 1 activity.

**MSC 113 Survival Training II (2) (CR/NC)**

Techniques of survival in a wilderness environment. Major emphasis on survival swimming and mountaineering, including evacuation techniques, rappelling and use of ropes. Open to all students. Credit/No Credit grading. 1 lecture, 1 activity.

**MSC 114 Basic Rifle Marksmanship (1) (CR/NC)**

Basic principles and techniques of rifle shooting, including rifle parts and operation, range and safety discipline and care of guns and ammunition. Rifle firing with .22 caliber rifles. Open to all students. Credit/No Credit grading. 1 activity.

**MSC 211 Orienteering (2)**

Principles of orienteering, basic map reading and compass skills; course running techniques applied in field orienteering events. 1 lecture, 1 activity.

**MSC 212 Basic Camp (1-7)**

Same material as MSC 112, 114, 211, and 213. One to seven units of credit may be granted depending upon successful completion of training. Six weeks of training, Fort Knox, Kentucky. Travel pay and salary provided through the Military Science Department. No obligation. Camp graduates eligible to enroll in ROTC Advanced Program.

**MSC 213 Leadership Assessment (2) (CR/NC)**

Overview of behavioral skills necessary for good leadership and an assessment center session in which the student participates in a series of exercises designed to simulate critical behaviors related to successful leadership and management. Credit/No Credit grading. 2 lectures.

**MSC 214 Advanced Rifle Marksmanship (1) (CR/NC)**

Rifle marksmanship techniques and skill development. Types of competition and rules for small bore rifle matches. Open to all students. Credit/No Credit grading. 1 activity. Prerequisite: MSC 114 or consent of instructor.

**MSC 311 Leadership and Management (3)**

Descriptive model of platoon leadership including personnel within a platoon and tasks of platoon leaders; major theories of leadership; instruction and practice in communication, human relations, organizational structure, power and influence, and management. 3 lectures.

**MSC 312 Basic Military Skills (2)**

Preparing, conducting and evaluating military training; use of military communications equipment, drill and ceremony; conducting physical conditioning. 2 lectures.

**MSC 313 Tactical Military Operations (3)**

Organization of the United States and Soviet land combat forces including tactical doctrine and equipment; organization of the modern battlefield; fundamentals of small unit tactics; planning, organizing and conducting small unit operations; fundamentals of land navigation. 3 lectures.

**MSC 411 Military Justice (2)**

Uniform code of military justice, including the court martial system, disciplinary measures, military crimes, search and seizure, apprehension and safeguarding evidence. Overview of the laws of war. 2 lectures.

**MSC 412 Military Professionalism and Ethics (3)**

Professional knowledge subjects including command and staff functions, personnel, training and logistics management, military correspondence and leadership counseling. Moral philosophy and values essential to the military profession. 3 lectures.

**MU—MUSIC****MU 100 Music Fundamentals—Applied (3)**

Traditional music notation: use of treble staff for pitch and rhythm, chord symbols and harmonization using principal triads, major and minor, and common seventh chords. 2 lectures, 1 activity.

**MU 101 Materials of Music—Theory I (3)****GEB C.2.**

Introduction to the elements of music and their use by composers and performers. Intended for students with little or no prior musical experience. Introduces notation of pitch and rhythm, scales, intervals and chords. Reference to musical examples from a variety of musical styles and periods. 3 lectures.

**MU 102 Ear-Training and Sight-Singing (1)**

Systematic development of skills in reading musical notation. Students taught to hear mentally what they see and to reproduce rhythm and pitch accurately through singing. 1 activity.

**MU 103 Rhythm Skills (1)**

Traditional music rhythmic notation through the use of the Tap Master rhythm system. This system involves the use of the Tap Master machine and a series of cassette tapes for individual instruction. 1 laboratory.

**MU 111 Beginning Piano (2)**

Beginning piano for student with no background in keyboard instruments. Includes fundamentals of notation, keyboard techniques, tone production, sightreading and facility. 1 lecture, 1 activity.

**MU 112, 113 Class Piano (2) (2)**

Continuation of MU 111. Piano for students with the ability to play a simple Bach or Mozart Minuet. Prerequisite: MU 111 or equivalent. 1 lecture, 1 activity.

**MU 131 Guitar (1)**

Fundamentals of guitar technique and performance including elements of both classical and folk guitar. Designed to meet the needs of the public school teacher. No previous experience necessary. 1 activity.

**MU 141 University Jazz Band (1)**

Limited to those who have had considerable experience playing musical instruments. Students have an opportunity to play for various university functions, dances, community programs, the annual Spring Tour and the Jazz Night concert (with a guest professional artist). 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 144 Symphony Orchestra (1)**

Open to any college student whose technique is adequate. In addition to standard repertory, the orchestra emphasizes unusual or rarely performed works. Select members of the orchestra are given additional opportunities to perform chamber music. 1 laboratory. Prerequisite: Consent of instructor. Total credit limited to 6 units.

**MU 147 Instrumental Ensembles (1)**

Open to qualified musicians. Rehearsal and public performances in trios, quartets, and quintets. 1 activity. Prerequisite: Consent of instructor. Total credit limited to 6 units.



**MU 151 Band (1)**

Study and public performance of music written for large wind band (woodwinds, brass, and percussion). Limited to those students who have had experience with band instruments. Band plays for many university functions, concerts, assemblies and athletic events, and makes at least one trip each year. Smaller groups are organized from the band for special functions. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 152 University Winds (1)**

Study and public performance of music written for small wind ensembles (woodwinds, brass and percussion) from the sixteenth century to the present. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 154 Cal Poly Men's Chorus (1)**

Study and performance of choral music composed for men's voices. Chorus performs each quarter on campus and sponsors an annual spring tour. Occasional concerts are in combination with the Cal Poly Women's Chorus. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 155 University Singers (1)**

Study and public performance of music for mixed voices from the sixteenth century to the present. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

**MU 157 Cal Poly Women's Chorus (1)**

Study and performance of choral music composed for women's voices. Chorus performs each quarter on campus and sponsors an annual spring tour. Occasional concerts are in combination with the Cal Poly Men's Chorus. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 158 Choral Jazz Ensemble (1)**

Open to qualified singers and instrumentalists. Rehearsal and public performance of choral jazz, pop, and Broadway hits. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 203 Theory II (3)**

Structure of tonality in music of Western civilizations, four-part writing of triads in root position and inverted, cadences and melodic structure, harmonic progressions, harmonization of a melody and nonharmonic tones. 3 lectures. Prerequisite: MU 101 or consent of instructor.

**MU 204 Appreciation of Music (3)**

**GEB C.2.**

Introduction to the music of major composers from the Renaissance to the present day. Includes a consideration of the historical background as well as the styles and forms used in Western art music. 3 lectures.

**MU 207 Jazz and Popular Music Arranging (3)**

Beginning techniques for combo and big band arranging. Arrangement planning, sketch scores, full scores, transpositions, part preparation and copying. Arrangements will be played by University groups. 3 lectures. Prerequisite: MU 101 or consent of instructor.

**MU 209 Jazz Styles (3)**

**GEB C.3.**

Survey of jazz from the 1920's to the present; its historical background and development in the United States. Big bands, combos, and soloists. Extensive use of recordings and live presentations. 3 lectures.

**MU 211, 212, 213 Class Piano (1) (1) (1)**

Intermediate level piano techniques with emphasis on style, interpretation, sight-reading, basic performance practices, and the solution to general musical problems. The classes proceed progressively. Total credit in each course limited to 2 units. 1 activity. Prerequisite: One year of piano or equivalent.

**MU 231 Instruments—Theory and Performance (1)**

Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Separate sections arranged with instructor. Total credit limited to 6 units. 1 activity.

**MU 237 Voice—Theory and Performance (1)**

Fundamentals of singing; breathing, posture, diction, development of voice, resonating chambers, vocal interpretation, sight singing. Total credit limited to 3 units. 1 activity.

**MU 301 Music for Children (3)**

Development of basic music proficiency; singing, conducting, playing simple instruments, accompaniment, rhythmic activities. Assumes a knowledge of music fundamentals. 3 lectures. Prerequisite: MU 100.

**MU 303 Theory III (3)**

Compositional techniques employed during the common practice period (1700- 1900). Dominant seventh chord, modulation, musical form. 3 lectures. Prerequisite: MU 203 or consent of instructor.

**MU 304 Music Composition (3)**

Composition of vocal and instrumental music in the smaller forms. Emphasis on contemporary compositional techniques. 3 lectures. Prerequisite: Theory II or consent of instructor. Repeatable to 9 units.

**MU 308 Conducting (2)**

Principles and techniques in conducting with experience in score reading. 2 lectures. Prerequisite: MU 101 or equivalent.

**MU 311, 312, 313 Class Piano (1) (1) (1)**

Designed for the advanced student able to play a Mozart or Beethoven sonata. Emphasis on general knowledge of piano literature, interpretation, style, and performance practices. Admittance to the class by audition. Total credit in each course limited to 2 units. 1 activity.

**MU 331 Instruments (1)**

Fundamentals of playing and teaching woodwind, brass, string, and percussion instruments. Continuation of MU 231. Total credit limited to 6 units. 1 activity.

**MU 337 Voice (1)**

Fundamentals of singing; breathing, posture, diction, development of voice, resonating chambers, vocal interpretation, sight singing. Continuation of MU 237. 1 activity. Total credit limited to 3 units. Prerequisite: One year of voice or equivalent.

**MU 341 University Jazz Band (1)**

Limited to those who have had two years of Jazz Band experience. Students have an opportunity to play for various university functions, dances, community programs, the annual Spring Tour and the Jazz Night concert (with a guest professional artist). 1 laboratory. Total credit limited to 6 units. Prerequisite: Two years of University Jazz Band participation.

**MU 344 Symphony Orchestra (1)**

Open to any college student whose technique is adequate. In addition to standard repertory, the orchestra emphasizes unusual or rarely performed works. Select members of the orchestra are given the additional opportunities to perform chamber music. Total credit limited to 6 units. 1 laboratory. Prerequisite: Two years of orchestra participation.

**MU 347 Instrumental Ensemble (1)**

Open to qualified musicians. Rehearsal and public performance in trios, quartets, quintets. Total credit limited to 6 units. 1 activity. Prerequisite: Consent of instructor.

**MU 351 Band (1)**

Study and public performance of music written for large wind band (woodwinds, brass and percussion). Limited to those students who have had two years of band. Band plays for many university functions, concerts, assemblies, and athletic events, and makes at least one trip each year. Smaller groups are organized from the band for special functions. Total credit limited to 6 units. 1 laboratory. Prerequisite: Two years of band participation and consent of instructor.

**MU 352 University Winds (1)**

Study and public performance of music written for small wind ensemble (woodwinds, brass and percussion) from the sixteenth century to the present. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 354 Cal Poly Men's Chorus (1)**

Study and performance of choral music composed for men's voices. Chorus performs each quarter on campus and sponsors an annual spring tour. Occasional concerts are in combination with the Cal Poly Women's Chorus. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 355 University Singers (1)**

Study and public performance of chamber music for mixed voices from the sixteenth century to the present. Total credit limited to 6 units. 1 laboratory. Prerequisite: Consent of instructor.

**MU 357 Cal Poly Women's Chorus (1)**

Study and performance of choral music composed for women's voices. Chorus performs each quarter on campus and sponsors an annual spring tour. Occasional concerts are in combination with the Cal Poly Men's Chorus. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 358 Choral Jazz Ensemble (1)**

Open to qualified singers and instrumentalists. Rehearsal and public performance of choral jazz, pop, and Broadway hits. 1 laboratory. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 367 Vocal Ensemble (1)**

Open to qualified singers. Rehearsal and public performance of vocal music. 1 activity. Total credit limited to 6 units. Prerequisite: Consent of instructor.

**MU 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**MU 404, 405, 406 History of Music (3) (3) (3)**

**All: GEB C.3.**

Intensive study of a selected topic in music history each quarter through the use of readings, recordings, and scores. Prior completion of one quarter of music appreciation or music theory is recommended. Each number may be repeated up to 6 units. 3 lectures.

## **NRM—NATURAL RESOURCES MANAGEMENT**

**NRM 101 Natural Resources of America (3)**

**GEB F.2**

Natural resources of the United States: forests, minerals, water, wildland, and wildlife. Integrated development, utilization and management of the nation's natural resources for the continuous benefit of man and the conservation of the resources. Not open to NRM majors for degree credit except as a free elective. 3 lectures.

**NRM 112 Parks and Outdoor Recreation (3)**

Introduction to national, state, county, city and private park systems. History, philosophy, policy and principles of the formation, administration and functioning of wildland recreational units at the park, district and regional levels. 3 lectures.

**NRM 140 Career Development and Planning in Natural Resources Management (1) (CR/NC)**

Analysis and development of career goals in natural resources. Acquainting students with potential career options and assisting them in planning and implementation phases of an academic career program at Cal Poly. Credit/No Credit grading. 1 activity. Prerequisite: Consent of instructor.

**NRM 201 Environmental Management (3)**

**GEB F.2**

Environmental management as a process within a functioning society seeking a harmonious balance between man's activities and intrinsic behavior of the natural environment. Major components of the natural environment and man's political and social activities that impact that environment. 3 lectures.

**NRM 203 Resource Law Enforcement (3)**

Law enforcement applied to natural resource conservation on public and private lands. Examination of state and federal laws related to fish and wildlife. Problems associated with implementation of resource laws examined. 3 lectures.

**NRM 300 Computer Applications in Resource Management (2) (Also listed FOR 300)**

Resource management applications of microcomputers. Software programs include forest and natural resource management planning, forecasting, analysis of systems, and resource data base management for multiple use objectives. Forestry and Natural Resource examples will be used. 1 lecture, 1 laboratory. Prerequisite: CSC 110, junior standing or consent of instructor.

**NRM 302 Natural Resources Policy (3)**

Historical development and significance of natural resource policies. Policy process approach to understanding the efforts to resolve natural resource problems in the public and private sector. 2 lectures, 1 laboratory. Prerequisite: FOR 201; NRM 112 suggested.

**NRM 304 Ecology of Resource Areas (4)**

Resource ecology and management implications in the major ecosystems of North America; the importance of maintaining the natural dynamics of energy flow and nutrient cycles at the community and ecosystem level for the benefit of man. Man's role as a principal factor of change in the resource of natural systems. 3 lectures, 1 laboratory. Prerequisite: One course in biological sciences or consent of instructor.

**NRM 310 Management of Outdoor Recreation Users (3)**

Examination of outdoor recreation user behavior through application of behavioral science principles and techniques. Behavioral information for the planning, management, and maintenance of outdoor recreation areas. 3 lectures. Prerequisite: NRM 112, PSY 201 or PSY 202.

**NRM 311 Environmental Interpretation (4)**

Interpretation of the biological, physical and aesthetic values of the natural elements of our environment; organization and presentation of interpretive materials by oral, written, and display methods of communication. 3 lectures, 1 laboratory. Prerequisite: SPC 201 or SPC 202.

**NRM 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**NRM 401 Natural Resource Economics (3)**

Principles of optimum use of renewable and nonrenewable natural resources, set in a framework of historical resource concerns and real world resource markets. Key resource sectors treated in detail: forestry, fisheries, water resources and natural environments. 2 lectures, 1 laboratory. Prerequisite: ECON 211, NRM 302.

**NRM 403 Environmental Impact Analysis (3)**

Environmental impact assessment process. Attention will be given to the historical background, legislation and techniques currently in use in the preparation of environmental documents for natural resource management agencies. Selected aspects of environmental law and regulations as applied to public agencies. 2 lectures, 1 laboratory. Prerequisite: NRM 304 or consent of instructor.

**NRM 405 Applied Resource Analysis (4)**

Evaluation of environmental responses to resource management programs. Preparation, implementation, and coordination of environmental activities in terms of multiple-use management. Establish criteria for measurements, interpretation, and evaluation. Resource inventories, analysis, synthesis, evaluation and report preparation. 3 lectures, 1 laboratory. Prerequisite: NRM 403 or consent of instructor.

**NRM 406 Natural Resources Administration (4)**

Administration of private and public natural resource units, including planning, budgeting, organizing, directing, staffing and controlling the units. 3 lectures, 1 laboratory. Prerequisite: NRM 302.

**NRM 407 Environmental Law (3) (Also listed as CRP 407)**

Detailed examination of the law governing use and protection of natural resources with focus on the legal institutions entrusted with the public duty of protecting the environment. 3 lectures. Prerequisite: Senior standing, POLS 206, or consent of instructor.

**NRM 408 Water Resource Law and Policy (3) (Also listed as CRP 408)**

Detailed examination of the various legal systems of water use, regulation and management in California and the United States. Discussion on the key concepts and principles of state, federal and interstate water quantity and quality control; focusing on issues and problems, why conflicts occur and how solutions evolve. 3 lectures. Prerequisite: NRM 302 or instructor approval, senior standing.

**NRM 409 Coastal Resource Management (4)**

Natural resource assessment, evaluation and management techniques and procedures in coastal environments (land and water), including overview and integration of the physical, biological, social, economic and political (current regulations and program structure) systems as they influence resource management decisions. 3 seminars, 1 laboratory. Prerequisite: NRM 405 or instructor approval. Field trips with lab are mandatory.

**NRM 410 Resource Recreation Management (4)**

Practices of management of resource recreation on private and public lands. Consideration of the following management systems: biophysical, user/visitor, facilities, equipment, fiscal, personnel will be made in the provision of resource recreation services. Case studies in mass recreation and wilderness areas will be examined. 3 lectures, 1 laboratory. Some weekend labs necessary. Prerequisite: NRM 112, NRM 310, or consent of instructor.

**NRM 417 Resource Recreation Planning (3)**

Development and analysis of resource recreation plans. Planning theory, types of plans, scheduling techniques, projecting supply and demand, application of models, and economic evaluations. Examples emphasize planning for parks and recreation. 2 lectures, 1 laboratory. Prerequisite: NRM 112.

**NRM 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**NRM 463 Undergraduate Seminar (2)**

Study and oral presentation of current developments and problems in the subject field. Discussion of recent findings and research and their application. 2 seminars.

**NRM 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**NRM 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**NRM 502 Resource Conservation (3)**

Conservation, planning and administration for broad treatment of land, water, mineral, forest, range, and wildlife resources. 3 seminars. Prerequisite: Graduate standing and consent of instructor.

**NRM 521 Natural Resources Management for Educators (3) (Also listed as AGED 521)**

Philosophy (theoretical and applied) of natural resource management strategies functioning in today's environment. Ecological principles applicable to specific resource components as they relate to the present perception of today's resource base, use demands and projected utilization. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**NRM 540 Water Resource Systems (3)**

Regional water resource systems with three components: (1) biophysical, (2) soc-eco-political including legal and (3) planning and management. Interface between and among components for synthesis for practical implementation in existing environments. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

**NRM 570 Selected Topics in Natural Resources Management (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 9 units. 1 to 3 seminars. Prerequisite: Graduate standing and consent of instructor.

**OH—ORNAMENTAL HORTICULTURE****OH 100 Orientation to Ornamental Horticulture (1) (CR/NC)**

Understanding the depth and breadth of the ornamental horticulture industry, the department, and the University. Student and professional organizations. Required of all students in the major. Credit/No Credit grading. 1 lecture.

**OH 101 Principles of Landscape Design I (3)**

Introduction to basic drafting skills and standards used in the landscape industry. Practice in the use of drafting tools and the application of lines, symbols and lettering to construct typical landscape drawings. Overview of the history of landscape design from ancient civilizations to the present. Students will need to acquire a prescribed list of drafting tools. 1 lecture, 2 laboratories.

**OH 125 Commercial Floral Design Practices (3)**

Theory, techniques, and skills currently practiced in the floral design industry. Construction of basic floral products for resale, cut flower processing, industry sales practices, merchandising and packaging. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 2 laboratories.

**OH 126 Ornamental Horticulture Construction (2)**

Construction and repair of projects, using materials and methods unique to ornamental horticulture. Design and construction of simple irrigation systems related to the broad horticulture field. 1 lecture, 1 laboratory.

**OH 131 Fundamentals of Ornamental Horticulture I (4)**

Introduction to and career potentials in the field of ornamental horticulture. Basic growing techniques dealing with structures, media, fertilization and related cultural practices. Field trip may be required. 3 lectures, 1 laboratory.

**OH 132 Fundamentals of Ornamental Horticulture II (3)**

Introduction to basic equipment and techniques in floriculture and floral design. Effects of environment on plant growth and relationships to commercial applications. Miscellaneous course fee required—see *Class Schedule*. Field trip may be required. 2 lectures, 1 laboratory. Prerequisite: OH 131.

**OH 133 Plant Propagation Fundamentals III (4)**

Introduction to commercial practices of plant propagation: seed, cuttings, grafting, layering, tissue culture. Discussion of the structures and environmental conditions utilized for plant propagation. Field trip may be required. 3 lectures, 1 laboratory. Prerequisite: OH 131, OH 132.

**OH 134 Landscape Maintenance Fundamentals IV(3)**

Maintenance of trees, shrubs, ground covers, cultural requirements, irrigation, pruning, fertilizing. Repair of irrigation systems, equipment. Landscape maintenance industry. 2 lectures, 1 laboratory. Prerequisite: OH 126 or consent of instructor.

**OH 145 Bonsai Culture (2)**

Philosophy, history, training, culture, production, and care of the Japanese Bonsai. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 activity.

**OH 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**OH 225 Floriculture Grades and Standards (3)**

Grades and standards for cut flowers, potted plants, and other ornamentals. Use of score cards in evaluating florist crops. 1 lecture, 2 laboratories. Prerequisite: OH 131.

**OH 230 Ornamental Gardening (3)**

GEB F.2.

For nonhorticulture majors. Information and recommendations for the home gardener. Methods of propagation, pruning, planting, soils, fertilizers, lawn planting and maintenance, pest and weed control, home landscaping, and identification and care of house plants. 2 lectures, 1 laboratory.

**OH 231, 232, 233 Plant Materials (4) (4) (4)**

Identification, habits of growth, cultural requirements, and use of ornamental woody and herbaceous plants used in the landscape of California. 3 lectures, 1 laboratory. Prerequisite: BOT 123.

**OH 237, 238, 239 Landscape Plants I, II, III (3) (3) (3)**

Woody and herbaceous plants used in California landscaping. Identification, landscape uses, cultural requirements and growth habits of those plants best shown during the fall, winter, and spring. For nonhorticulture majors. Field trips required. 2 lectures, 1 laboratory.

**OH 240 Principles of Greenhouse Environment (4)**

Analysis of problems and practices affecting the contemporary commercial horticulturist. Analysis and operation of greenhouses and related equipment stressing the effect of environment on plant growth. 3 lectures, 1 laboratory. Prerequisite: OH 131 and OH 132, or consent of instructor.

**OH 243 Turf Management (4)**

Turf propagation, irrigation, fertilizer and pest control methods and procedures. Turf grass varieties and uses. Turf equipment. 3 lectures, 1 laboratory.

**OH 250 Principles of Landscape Design II (3)**

Basic principles and elements of landscape design related to the problem solving process, design theory and composition, introduction to the creative problem solving process as a means to developing a landscape design, functional and design uses of landscape materials, client and maintenance criteria and an expansion of drafting skills including perspective. 1 lecture, 2 laboratories. Prerequisite: OH 101, OH 126, OH 131, OH 132, OH 134 and one plant ID course.

**OH 251 Ikebana (3)**

Techniques of the ancient art of Ikebana as it influences western floral design. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: OH 132.

**OH 252 Continental Mass Design (3)**

History, theory and application of techniques of mass flower arranging. Traditional influences on commercial floral design practices in Continental Europe and North America. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: OH 132.

**OH 253 Stylized Western Design (3)**

Techniques of western stylized line design as it is known currently. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory. Prerequisite: OH 132.

**OH 302 Ornamental Horticulture Sales and Service (3)**

Historical establishment of the retail horticulture centers. Relating basic marketing and management principles to the unique conditions found in typical ornamental horticulture sales and service establishments. Field trip required. 2 lectures, 1 activity. Prerequisite: OH 125, OH 132.

**OH 320 Landscape Media (3)**

Various media essential to present designs in the landscape industry. Basic techniques of design presentation involving plan, elevation, section and detail drawings, perspective, model construction and photography. Required field trip. 1 lecture, 2 laboratories. Prerequisite: OH 101, OH 250.

**OH 321 Residential Landscaping (4)**

Principles of landscape design for residential properties. Designing of several small home properties. 2 lectures, 2 laboratories. Prerequisite: OH 250, and two Plant Materials courses.

**OH 322 Advanced Landscape Design (4)**

Practical application of landscape design for small scale public or commercial spaces. Realistic design projects: site and user analysis, interior plantscape design, parking, circulation, design materials, street furniture and plant composition. Field trip required. 2 lectures, 2 laboratories. Prerequisite: OH 321.

**OH 324 Foliage Plant Culture (4)**

Identification, propagation, production, marketing, utilization and maintenance of plants intended for interior plantscaping. 3 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

**OH 327 Diseases and Pests of Ornamental Plants (4)**

Diseases and pests of ornamental plants, their effect on plants, their prevention and control. 3 lectures, 1 laboratory. Prerequisite: ENT 220, BOT 324.

**OH 328 Advanced Floral Design (4)**

Advanced styling of floral designs used in sympathy work; casket sprays, wreaths, hospital arrangements, and solid work. Field trip required. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: OH 132.

**OH 329 Advanced Floral Design (4)**

Advanced styling of floral designs to wear and carry, as practiced specifically in wedding work. Field trip required. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: OH 328.

**OH 330 Art of Flower Arrangement (3)**

Theory and practice of use of plant materials as art medium in creating floral design. Application of universal art principles to flower and foliage decorations. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 laboratory.

**OH 331 Landscape Contracting (4)**

Practices in supervising personnel and applying standard techniques in landscape construction. Cost finding and estimating for landscape trades. 3 lectures, 1 laboratory. Prerequisite: OH 101, OH 126, OH 250.

**OH 332 Landscape Contracting (4)**

Practices in supervising personnel and applying standard techniques in landscape construction cost finding and estimating for landscape trades. Rules, regulations, and licensing laws, set forth by the State of California, governing landscape contractors. 3 lectures, 1 laboratory. Prerequisite: OH 331.

**OH 333 Advanced Turf Management (4)**

Maintenance and operation of large areas such as golf greens, athletic fields, and park areas. Systems of management and maintenance, business aspects, and turf industry. 3 lectures, 1 laboratory. Prerequisite: OH 243.

**OH 337 Park Planning and Management (4)**

Design, management and maintenance of private and public parks and recreational areas. Field trips required. 3 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

**OH 338 Advanced Plant Propagation (4)**

Current propagation practices with emphasis on producing and scheduling the early nursery phases of woody ornamental crops. Includes seed harvesting, handling and treatments; cutting production; and grafting/budding techniques. 3 lectures, 1 laboratory.

**OH 341 Cut Flower Production (4)**

Production of cut flowers and other fresh florists' commodities in greenhouses and outdoors. Preparation and scheduling of such commodities for major markets. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 240, SS 221 and consent of instructor.

**OH 342 Potted Plant Production (4)**

Production of major commercial potted plants in greenhouses and outdoors. Preparation and scheduling of potted flowering greenhouse crops for major markets. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 341 and consent of instructor.



**OH 381 Advanced Plant Materials (3)**

Recognition, identification, ecological significance, propagation, uses and landscape potential, environmental impact, and cultural needs of California flora as they pertain to the horticultural field, and natural resource management. 2 lectures, 1 laboratory. Prerequisite: Junior standing and consent of instructor.

**OH 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**OH 401 Field Studies in Ornamental Horticulture (1)**

Field trip to ornamental horticulture outlets and the industry businesses that supply them. Garden centers, flower shops and garden center flower shop combinations. Foundation and display gardens with retail outlets and public educational facilities. Required field trip includes wholesalers, jobbers, display houses, advertising agency and others working with the retailers. 1 activity.

**OH 402 Advanced Ornamental Horticulture Sales and Services (4)**

Legal aspects and economics of operating a commercial nursery and garden center. State and county regulations; quarantines, grades and standards of nursery stock and floral design materials. Purchasing, merchandising and record keeping. Trade associations and cooperative buying. 3 lectures, 1 laboratory. Field trip required. Prerequisite: OH 302 or ECON 211, junior standing or consent of instructor.

**OH 410 Weed Control in Ornamental Plants (4)**

Weed impact and control in ornamental plants including weed identification and biology, control strategies and characteristics and use of herbicides. 3 lectures, 1 laboratory. Prerequisite: OH 133 or consent of instructor.

**OH 421 Arboriculture (4)**

Care and management of large ornamental trees. Use of ropes and other safety equipment in tree climbing. Cavity work, bracing, cabling, and pruning. 3 lectures, 1 laboratory. Prerequisite: OH 134, OH 231, OH 232, OH 233.

**OH 424 Wholesale Nursery Management (4)**

Commercial nursery operations including container plant handling, growing media, fertilization, weed control, container sizing, pruning and staking, systems analysis, production and inventory control and marketing. History and overview of the nursery industry. Field trip required. 3 lectures, 1 laboratory. Prerequisite: OH 133, SS 221, senior standing, or consent of instructor.

**OH 425 Tissue Culture Propagation (2)**

Principles of tissue culture applied to the propagation of ornamental plants. Systems applicable to commercial crops, laboratory organization, media, and current research. Miscellaneous course fee required—see *Class Schedule*. 1 lecture, 1 activity. Prerequisite: Junior standing and consent of instructor.

**OH 426 Systematic Plant Problem Solving (2)**

Diagnosing plant disorders through systematic inquiry process. Oral examinations require students not only to identify plant disorders but effectively to determine how the problem evolved. 1 lecture, 1 laboratory. Prerequisite: Senior standing, OH 327 and consent of instructor.

**OH 434 Landscape Management (3)**

Maintenance procedures and operations. Estimating scheduling, recordkeeping and implementation of landscape maintenance projects. Interior landscape maintenance. 2 lectures, 1 laboratory. Prerequisite: OH 126, OH 134 or permission of instructor.

**OH 443 Greenhouse Management (4)**

Problems and practices in the management of greenhouses. Scheduling greenhouse crops, planning crop rotation, cost accounting for floricultural crops, management decisions in production costs and personnel matters. Field trips required. 3 lectures, 1 laboratory. Prerequisite: OH 342 or consent of instructor.

**OH 454 Ornamental Horticulture Irrigation Systems (4)**

Irrigation system design with emphasis on landscape, nursery and specialized systems, materials and installation. 2 lectures, 2 laboratories. Prerequisites: OH 250, AE 337 and senior standing.

**OH 460 Senior Seminar (1)**

Open forum for senior students presenting information and developing skills necessary for searching and career planning in professional horticulture. Exposure to current practices, procedures and developments in the OH industry. 1 seminar. Prerequisite: Completion of all lower division major courses and senior standing.

**OH 461 Senior Project (2)**

Selection of a project under faculty adviser approval. Initial research and data gathering period for project information. Projects typical of problems which graduates must solve in their fields of study or employment. Project results are presented in a formal written report completed in OH 462. Contract drawn up with approval of adviser. Minimum 60 hours. Prerequisite: All 100–200 level courses in OH curriculum; 135 units; ENGL 114, ENGL 218 taken concurrently.

**OH 462 Senior Project (2)**

Continuation of Senior Project development. Writeup of rough draft and formal draft of project. Completion of formal written report under adviser supervision. Minimum 60 hours. Prerequisite: OH 461 completed.

**OH 470 Selected Advanced Topics (1–3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**OH 471 Selected Advanced Laboratory (1–3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**OH 581 Graduate Seminar in Ornamental Horticulture (3)**

Group study of current problems of the ornamental horticulture industry; current experimental and research findings as applied to production and to the teaching of horticulture. 3 seminars.

## PE—PHYSICAL EDUCATION

### Number Fields for Physical Education Courses

	Coed (PE)	Men (PEM)	Women (PEW)
General activities .....	100–165		
Intramural activities .....	174		
Competitive athletics .....	181–199	181–199	181–199
Professional activities (PE majors or related option students only) .....	206–239		
Academic courses .....	240 up		

### GENERAL ACTIVITIES

Enrollment is open to all students except for designated intramural courses. Courses carry 1 unit of credit, meet 2 hours per week, and are designed to develop skill, knowledge of rules, background and analysis of techniques, and desirable attitudes toward physical fitness and participation in sports.

The beginning course or its equivalent is prerequisite to the intermediate, and the intermediate to the advanced. Prerequisite may be waived by consent of the instructor.

No more than two different activity courses nor more than one section of an individual activity course may be taken for credit in any one quarter. A student may not enroll simultaneously in the same quarter for a beginning, intermediate and/or advanced activity course. Any level of an activity course can be repeated only once for credit.

Students not majoring in physical education may apply a maximum of 12 units of credit earned in general and intramural activity courses toward the bachelor's degree.

All general activity courses (PE 100–174) are evaluated on a Credit/No Credit basis. A miscellaneous course fee may be required—see *Class Schedule*.

### Coed

PE 100 Adaptive Activity	PE 138 Karate
PE 101 Gymnastics	PE 139 Soccer
PE 103 Archery	PE 142 Softball
PE 104 Badminton, Beg.	PE 143 Life Saving, Adv.
PE 105 Badminton, Int.—Adv.	PE 144 Swimming, Beg.
PE 108 Basketball	PE 145 Swimming, Int.
PE 109 Bowling	PE 146 Swimming, Adv.
PE 110 Cycling	PE 148 Tennis, Beg.
PE 111 Fencing	PE 149 Tennis, Int.—Adv.
PE 116 Aerobic Exercise	PE 150 Tumbling-Vaulting
PE 121 Golf, Beg.	PE 151 Volleyball, Beg.
PE 122 Golf, Int.—Adv.	PE 152 Volleyball, Int.—Adv.
PE 125 Jogging	PE 154 Weight Training
PE 126 Judo	PE 156 Aqua-Calisthenics
PE 129 Hatha Yoga	PE 158 Synch. Swimming
PE 131 Physical Conditioning	PE 159 Wrestling
PE 132 Racquetball, Beg.	PE 161 Canoeing
PE 133 Racquetball, Int.—Adv.	PE 162 Windsurfing
PE 135 Skin Diving	PE 165 Skiing
PE 136 Scuba Diving	PE 174 Intramurals
PE 137 Self-Defense	

**COMPETITIVE ATHLETICS**

Enrollment limited to those academically qualified to compete in intercollegiate athletic programs. Consent of coach required. Total credit limited to 8 units. Courses are each 2 units and meet for a minimum of 10 hours per week. All competitive athletics courses are evaluated on a Credit/No Credit basis.

**Men**

PEM 182	Baseball
PEM 183	Basketball
PEM 184	Cross Country
PEM 185	Football
PEM 189	Soccer
PEM 191	Swimming
PEM 192	Tennis
PEM 193	Track and Field
PEM 196	Wrestling

**Women**

PEW 183	Basketball
PEW 184	Cross Country
PEW 187	Gymnastics
PEW 190	Softball
PEW 191	Swimming
PEW 192	Tennis
PEW 193	Track and Field
PEW 194	Volleyball

**PROFESSIONAL ACTIVITIES**

Priority for enrollment given to those students pursuing a major in Physical Education. Physical Education majors may apply a maximum of 24 units of credit earned in PE 101-239 toward the bachelor's degree. When applicable, course selection should be determined by the student after consultation with his/her adviser. All courses are one or two units and meet for two or four hours per week. All professional activities are designed to attain intermediate skills in performance and analysis and knowledge of rules and strategy. Prerequisites in the PE 101-165 series activities will be required for those students who cannot demonstrate minimum skill levels.

PE 206	Tumbling-Vaulting (2)	PE 216	Wrestling (1)
PE 207	Apparatus (2)	PE 217	Flag Football/Football (1)
PE 208	Golf (1)	PE 218	Aquatics (2)
PE 210	Tennis (1)	PE 221	Combatives/Self Defense (1)
PE 211	Softball-Baseball (1)	PE 222	Archery (1)
PE 212	Handball/Racquetball (1)	PE 223	Cross Country and Track Events (1)
PE 213	Basketball (1)	PE 224	Field Events (1)
PE 214	Volleyball (1)	PE 225	Team Handball (1)
PE 215	Field Sports (Soccer, Speedball, Speed-away) (2)	PE 226	Field Hockey (1)
		PE 229	Badminton (1)

**ACADEMIC COURSES**

Professional courses designed primarily for the student majoring in physical education. PE 250 may be used in partial satisfaction of the General Education-Breadth requirement in physical education.

**PE 241 Fitness and Training: Scientific Basis (1)**

Introduction to physiological principles and factors which provide the basis for the development and maintenance of optional physical fitness. 1 lecture. Prerequisite: Concurrent enrollment in PE 110, PE 116, PE 125, PE 131, PE 145, PE 146, PE 154 or PE 156.

**PE 245 Adaptive Aquatics in Physical Education and Recreation (2) (Also listed as REC 245)**

Adaptive techniques in working with the disabled in aquatics; physical, mental, emotional, social, and recreational involvements utilizing aquatics as the treatment modality. 1 lecture, 1 two-hour laboratory.

**PE 250 Health Education (2)****GEB E.2.**

Introductory health course geared to bridge the gap between scientific health discoveries and one's application of these discoveries in the daily living pattern. 1 lecture, 1 recitation.

**PE 252 Beginning Athletic Training (2)**

Modern principles and practices in the prevention, treatment, rehabilitation and follow-up care of athletic injuries. Functions and limitations of the athletic trainer as an athletic paramedic. Theory and practice of adhesive strapping as related to supporting major body joints for athletic participation. 2 two-hour activities. Prerequisite: ZOO 131.

**PE 254 School Health Program (2)**

Introduction to school health services, instruction, and environment within the public and private school system. 2 lectures.

**PE 270 Introduction to Physical Education (2)**

Designed to acquaint the student with the concept of physical education as a profession and to orient the student to the Cal Poly program. 2 lectures.

**PE 275 Sports Officiating (2)**

Designed to provide knowledge, understanding, appreciation of officiating in general, and the development of skills in officiating. 1 lecture, 1 two-hour laboratory.

**PE 280 First Aid and CPR (3)**

Standard American Red Cross first aid and CPR course. Instruction and practice in the immediate and temporary care of injuries and sudden illness. 2 lectures, 1 two-hour laboratory.

**PE 284 Water Safety (1)**

Review of life saving skills, analysis of swim strokes and techniques, teaching experience. Upon successful course completion, students are eligible for examination for a Red Cross W.S.I. card. Curriculum requirements can be satisfied even though card requirements are not fulfilled. 2 one and one-half hour laboratories. Prerequisite: Current life saving card or consent of instructor.

**PE 296 Planning Techniques in Physical Education (3)**

Practical skills and techniques of teaching physical education in schools. Unit and lesson planning and organizing, class management and procedure, teaching aids, evaluation skills. 2 lectures, 1 two-hour laboratory.

**PE 301 Scientific Bases of Sport Performance (3)**

Practical application of principles of biomechanics, motor learning, and physiology to sport performance, skill learning, and the conditioning process. Not open for credit to PE majors. 3 lectures. Prerequisite: One college course in Animal Biology; ZOO 131 recommended.

**PE 302 Mechanical Kinesiology (4)**

Fundamental biomechanical concepts and their application to human movement activities, and analyses of exercise mechanics and skill performance. 3 lectures, 1 three-hour laboratory. Prerequisite: ZOO 237 and ZOO 340.

**PE 303 Physiology of Exercise (4)**

Application of the knowledge of human physiology to exercise situations. 3 lectures, 1 three-hour laboratory. Prerequisite: ZOO 300.

**PE 305 Drug Education (2)**

Instruction on the nature and effect of the use of tobacco, alcohol, narcotics and restricted dangerous drugs. 2 lectures.

**PE 306 Exercise and Health Promotion for Senior Adults (3)**

Special fitness, exercise, and health needs of the senior population. Theories of aging and age-related changes. Health promotion, exercise needs and activity programs for senior adults. 3 lectures. Prerequisite: PE 250, junior standing or consent of instructor.

**PE 312 Coaching Aquatics (2)**

Supervision of swimming pool activities. Coaching swimming and water polo. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 218 or consent of instructor.

**PE 319 Measurement and Evaluation in Physical Education (4)**

Principles of test selection and administration, measurement and evaluation of characteristics and data, library research, data analysis, experimental design, questionnaire construction and sampling techniques related to physical education. 3 lectures, 1 two-hour laboratory. Prerequisite: STAT 211, STAT 212.

**PE 321 Coaching Football (2)**

Fundamentals and systems of offensive and defensive football. Preparation for interscholastic coaching. Rules of the game. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 217 or consent of instructor.

**PE 322 Coaching Basketball (2)**

Theories of coaching, principles of organization of interscholastic basketball. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 213 or consent of instructor.

**PE 323 Coaching Baseball (2)**

Fundamentals of baseball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 211 or consent of instructor.

**PE 325 Coaching Softball (2)**

Fundamentals of softball with emphasis on strategy, selection of players, officiating, interpretation of rules, scoring, and administration of interschool games. Slow pitch as well as fast pitch techniques will be emphasized. 1 lecture, 1 two-hour laboratory.

**PE 327 Coaching Wrestling (2)**

Coaching techniques of wrestling. Theories of coaching principles and organization of interscholastic wrestling. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 216 or consent of instructor.

**PE 332 Teaching Elementary Physical Education (4)**

Prepares the student to guide elementary school age children through a well-balanced program in physical education. Aims, objectives, procedures, methods, evaluation and program planning. 2 lectures, 2 two-hour laboratory.

**PE 344 Coaching Volleyball (2)**

Techniques and theories of individual fundamentals, game strategies, and problems of coaching secondary and collegiate level athletes. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 214 or consent of instructor.

**PE 356 Coaching Gymnastics (2)**

Techniques and problems in teaching gymnastics. Practical experience in organizing interscholastic gymnastics. Theories of coaching principles and analysis of stunts. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 206, PE 207, or consent of instructor.

**PE 375 Teaching Secondary Physical Education (4)**

Techniques in teaching physical education in junior and senior high school. 2 lectures, 2 two-hour laboratories. Prerequisite: Two team and two individual professional activity courses or consent of instructor and PE 296.

**PE 379 Coaching Track and Field and Cross Country (2)**

Techniques and problems in teaching track and field and cross country. 1 lecture, 1 two-hour laboratory. Prerequisite: PE 223, PE 224, or consent of instructor.

**PE 400 Special Problems for Advanced Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units, with a maximum of 3 units per quarter. Prerequisite: Senior standing or consent of instructor.

**PE 401 Organization and Administration of Health and Physical Education (3)**

Underlying philosophy, principles, policies, and procedures of administration as applied to health and physical education in various settings such as schools, dance studios, and public/private fitness clubs and programs. 3 lectures.

**PE 402 Introduction to Motor Learning (3)**

An analysis of factors which affect the acquisition of motor skills as related to the learner, the learning process, and the learning environment. 3 lectures. Prerequisite: PE 319.

**PE 405 Administration of Health Education (2)**

Current procedures and policies in the development and basic administration of public and school health education programs. 2 lectures.

**PE 406 Adaptive Physical Education (4)**

Characteristics of special populations; how their physical education needs can be met through special and regular programs. 3 lectures, 1 two-hour laboratory. Prerequisite: ZOO 237, ZOO 300.

**PE 407 Adapted Physical Education Program Development (3)**

Practical exploration of the development of individualized programs designed to meet the needs of the handicapped. Development of sports programs and physical conditioning for selected disabilities. 3 lectures. Prerequisite: PE 406.

**PE 410 Psychology of Coaching (3)**

Psychological considerations of the coach-athlete relationship and mental preparation of teams and individuals for competition and practice. Special emphasis on the male and female adolescent with regard to the psychological implications of sports participation. 3 lectures.

**PE 412 Contemporary Issues in Sport (3)**

Selected topics dealing with sports as a social phenomenon in American life. Each course will have a subtitle descriptive of the content. May be repeated to 9 units. 3 lectures.

**PE 416 Physical Education/Recreation Facilities (3) (Also listed as REC 416)**

Management, clientele considerations, facilities and outdoor areas planning and operations, personnel, finance and equipment as related to physical education and recreation areas and facilities. Field visits required. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-PE/REC majors.

**PE 424 Organizing and Teaching Physical Education (3)**

Organization, selection, presentation, application, and interpretation of subject matter in physical education. 3 lectures. Prerequisite: Consent of instructor.

**PE 432 Athletic Training and Rehabilitation (2)**

Modern principles and practices in conditioning and care of athletes. Theory and practice in the scientific manipulation of the muscles as related to therapeutic exercise. 2 two-hour laboratories. Prerequisite: PE 252.

**PE 434 Foundations for Development of Conditioning Programs (2)**

Application of scientific principles and rationale for the development of physical conditioning programs for assorted populations, including the normal child and adult, the handicapped, the middle-aged, the elderly and the highly competitive male or female athlete. Investigation of current theories, philosophies and practices of strength, endurance and flexibility development. 2 lectures. Prerequisite: PE 252, PE 302, PE 303.

**PE 437 Directed Field Work (1-3)**

Practical work experience in related phases of physical education under qualified supervision. Total credit limited to 9 units. Minimum of 2 laboratory hours per week per unit. Prerequisite: Senior standing or consent of adviser.

**PE 438 Adaptive Physical Education Field Work (1-3)**

Practical work experience in adaptive physical education under qualified supervision. Students required to work with elementary school, secondary school and postsecondary age people. Total credit limited to 6 units. Prerequisite: Consent of instructor one quarter prior to enrollment; PE 406, PE 407.

**PE 440 Physical Education Practicum (1)**

Supervised experience involving organizational and instructional responsibilities in activity, lecture and/or laboratory classes as determined by curricular option or certificate program. Total credit limited to 3 units, 2 hours per week. Prerequisite: Consent of instructor.

**PE 445 Principles of Electrocardiography and EKG Interpretation (3)**

Basic principles of electrocardiography, emphasizing a knowledge of resting and exercise EKG monitoring procedures, interpretation skills of normal and abnormal heart function including vector abnormalities of myocardial infarction, arrhythmias and conduction irregularities, and an understanding of the primary cardiac drugs. 2 lectures, 1 laboratory. Prerequisite: ZOO 237, ZOO 238, ZOO 239, CHEM 328, PE 303 or consent of instructor.

**PE 450 Lifestyle Management in a Physical Fitness Setting (3)**

Designed to acquaint students with those events, situations and relationships leading to healthy lifestyles in fitness and occupational settings. Emphasis on stress and time management, exercise, nutrition and relaxation techniques. 2 lectures, 1 laboratory. Prerequisite: Senior standing; nonmajors: consent of instructor.

**PE 451 Nutrition for Fitness and Sport (3)**

Application of nutritional facts to selected aspects of physical training, degenerative disease, obesity and weight control, diet manipulation and modification in sport, nutrition supplementation and special dietary considerations for the young and old, male and female athletes. 3 lectures. Prerequisite: HE 210 and PE 303.

**PE 452 Testing and Exercise Prescription for Fitness Specialists (3)**

Selected areas of health/fitness screening and evaluation. Application of components relevant to the development and administration of exercise programs for persons regardless of sex, age, functional capacity and presence or absence of CHD or CHD risk factors. 1 seminar, 2 laboratories. Prerequisite: HE 210, PE 303, PE 445 or consent of instructor.

**PE 461, 462 Senior Project (3) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 150 hours total time. Prerequisite: PE 302, PE 303, PE 319, ENGL 302 or ENGL 310, or adviser approval.

**PE 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 lectures. Prerequisite: Consent of instructor.

**PE 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 laboratories. Prerequisite: Consent of instructor.



**PE 474 History and Philosophy of Physical Education (3)**

History of physical education including philosophical, institutional, and personal influences. Application of education principles to physical education. 3 lectures. Prerequisite: PE 270.

**PE 500 Individual Study (1-3)**

Advanced study planned and completed under the direction of a member of the department faculty. Open only to graduate students who have demonstrated ability to do independent work. Enrollment by petition. Only 6 units may be applied to degree requirements. Prerequisite: PE 517 and consent of department head, graduate adviser, and supervising faculty member.

**PE 501 Administration of Adapted Physical Education Programs (3)**

Principles, policies, and procedures of administration as applied to the adaptive physical education program for the elementary and secondary school levels. Legal aspects involving city, county, state and national agencies. Assessment of program effectiveness. 3 seminars. Prerequisites: PE 406, PE 407.

**PE 502 Seminar in Problems of Physical Education (3)**

Practical problems in physical education and their solution in terms of desired objectives in this field. 3 seminars.

**PE 503 Seminar in Adult Wellness (3)**

Advanced seminar investigating topics relating to wellness in adults. Cardiovascular, respiratory, and stress related diseases as well as health issues in the later years. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**PE 511 Administration of Physical Education and Athletics (3)**

Principles and techniques of administration of physical education and athletics on the elementary and secondary school levels. 3 seminars.

**PE 512 Critical Health Issues (3)**

Selected topics dealing with health and wellness appraisal, planning and management. Each course will have a subtitle descriptive of the content. May be repeated to 9 units. 3 seminars.

**PE 513 Evaluation of Current Studies (3)**

Analysis and evaluation of published studies in physical education, health education and recreation. 3 seminars. Prerequisite: PE 517.

**PE 517 Research Methods in Physical Education (3)**

Experimental, descriptive, historical, philosophical, and action research in physical education. Selection of adequate problems for investigation; various sampling techniques and analyses; use of library facilities; manuscript requirements for the thesis. 3 seminars. Prerequisite: PE 319 or consent of instructor.

**PE 522 Biomechanics (3)**

Advanced biomechanical concepts applied to human movement, examination of research, and biomechanical analyses of movement activities. 3 seminars. Prerequisite: PE 302 or equivalent.

**PE 525 Human Performance and Learning (3)**

Analysis of research principles and concepts and variables related to human motor performance and learning with emphasis on the information processing approach for evaluating performance. 3 seminars.

**PE 526 Sport in American Society (3)**

Understanding the role of sport in American society as viewed from sociological and psychological perspectives. Effect of success and failure in competitive sport situations. 3 seminars.

**PE 530 Advanced Physiology of Exercise (3)**

Effects of exercise on human beings in relation to performance and physiological adjustment to activity. 3 seminars. Prerequisite: PE 303.

**PE 536 Electrocardiography (3)**

Development and application of advanced skills for reading and interpreting resting and exercise electrocardiograms including abnormalities associated with myocardial infarctions, rhythm disturbances, conduction defects, electrolyte imbalance and drug treatment. 3 seminars. Prerequisite: PE 445 or equivalent.

**PE 581 Graduate Seminar in Physical Education (1-3)**

Directed group study of selected topics for advanced students. Class schedule will list topic selected. Total credit limited to 6 units. 1-3 seminars. Prerequisite: Graduate standing or consent of instructor.

**PE 599 Thesis (3) (3)**

Independent research under the guidance and supervision of the staff. Only 6 units of credit may be applied to degree requirements. Students must enroll every quarter in which advisement is received. Prerequisite: PE 517, consent of graduate adviser and supervising faculty member.

**PHIL—PHILOSOPHY****PHIL 125 Critical Thinking (3) (Also listed as ENGL 125 and SPC 125)****GEB A.2.**

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the criticism and composing of arguments in English. 3 lectures. Prerequisite: ENGL 114.

**PHIL 225 Symbolic Logic I (3)**

Methods of proof in propositional and predicate logic including conditional and indirect proof procedures. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 230 Philosophical Classics (3)****GEB C.1.**

Readings of various philosophic classics with focus on the identification and evaluation of the central metaphysical and epistemological themes. Various major arguments through a case mode presentation. 3 lectures.

**PHIL 231 Philosophical Classics (3)****GEB C.1.**

Readings with focus on the identification and evaluation of the central themes of ethics, social and political philosophy. Various major arguments through a case mode presentation. 3 lectures.

**PHIL 305 Judeo-Christian Religions (3)****GEB C.3.**

Origins, beliefs, practices and philosophies of Judaism and Christianity, and of the ancient Middle Eastern Religions which led to their development. Influence of these religions on the West and the logic of their religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 306 Asian Religions (3)****GEB C.3.**

Origins, beliefs, practices and philosophies of the religions of the Hindus, Buddhists, Taoists, Confucianists and Shintoists and other faiths common to India and the Far East. Influence of these religions on the world and the logic of their religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 308 Islamic Religions (3)****GEB C.3.**

Beliefs, ethics and religious practices of Islam. Historical development of the Islamic tradition. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 311 History of Greek Philosophy (3)****GEB C.3.**

Beginnings of Western science and philosophy. Pre-Socrates, Socrates, Plato, and Aristotle. Greek philosophies in the Roman world. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 312 History of Medieval Philosophy (3)****GEB C.3.**

Developments of Western philosophy from Augustine to Ockham, especially the philosophies of Anselm, Abelard, Roger Bacon, Bonaventure, and Aquinas. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 313 Continental Philosophy: Montaigne to Leibnitz (3)****GEB C.3.**

Developments of Western philosophy from the Renaissance through Leibnitz with special emphasis upon the philosophies of the Continental Rationalists. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 314 British Philosophy: Bacon to Mill (3)****GEB C.3.**

Developments of Western philosophy from the Renaissance through Mill with special emphasis upon the philosophies of the British Empiricists. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 315 German Philosophy: Kant to Nietzsche (3)****GEB C.3.**

Primary issues and concepts found in German philosophy from 1780 to 1900, with emphasis on Kant, Hegel, Marx, Kierkegaard, Schopenhauer, and Nietzsche. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 316 Contemporary European Philosophy (3)****GEB C.3.**

Recent movements within the Continental tradition, including French and German existentialism, phenomenology, and post-metaphysical philosophy. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 317 Contemporary British and American Philosophy (3)****C.3.**

Distinctly Anglo-American philosophical movements of the twentieth century including pragmatism, realism, relativism, positivism and various schools of analytic philosophy. 3 lectures. ENGL 125 or PHIL 125 or SPC 125.

**PHIL 321 Philosophy of Science (3)****GEB C.3.**

Methods of physics, biology, psychology and other selected sciences, with reference to their presuppositions and general findings. Relations between the sciences and implications of scientific methods for other fields of inquiry. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 325 Symbolic Logic II (3)**

Propositional and predicate logic, predicate logic with identity and definite descriptions. Metalogical foundations of modern symbolic logic. 3 lectures. Prerequisite: PHIL 225.

**PHIL 331 Ethics (3)****GEB C.3.**

Inquiry into the problems of the principles of right action and justice, of moral character and motivation, and of the good life. Examination of traditional and contemporary answers to these problems and the implications of those answers. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 333 Political Philosophy (3)****GEB C.3.**

Philosophic foundation of political ideologies. Freedom, state, law, obligation, sanction, and their relation to metaphysics, theory of knowledge, and ethics. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 335 Social Ethics (3)****GEB C.3.**

Ethical theory and critical analysis applied to the resolution of such public policy issues as abortion, euthanasia, children's rights, family law, racial and sexual discrimination, government regulation of business, technology and ecology. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 337 Professional Ethics (3)****GEB C.3.**

Critical examination of ethical problems arising in the professions. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 341 Philosophy of Art (3)****GEB C.3.**

Theories about the nature and evaluation of artistic and literary phenomena. Relationship of art and literature to ethics, metaphysics, religion, political philosophy and epistemology. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**PHIL 342 Philosophy of Religion (3)****GEB C.3.**

Inquiry into the nature of religious experience and claims, naturalism and supernaturalism, arguments for the existence of God, the problem of evil, miracles, revelation, faith, human nature and destiny, verification and refutation of religious claims. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

## PHYS—PHYSICS

### PHYS 104 Introductory Physics (4)

GEB B.1.a.

Fundamental principles of mechanics, heat, light and electricity. Not to be taken by students who have taken a college course in physics. 4 lectures. Prerequisite: MATH 103, MATH 114 or MATH 120.

### PHYS 121 College Physics (4)

GEB B.1.a.

An introductory course in mechanics emphasizing motion, force, and energy. Not open for credit to students having a grade of C or better in PHYS 131. 3 lectures, 1 laboratory. Prerequisite: MATH 115 or MATH 120.

### PHYS 122 College Physics (4)

GEB B.1.a.

Continuation of PHYS 121. Topics include properties of materials, fluids, waves and vibrations, sound, heat, light and optics. Not open for credit to students having a grade of C or better in PHYS 132. 3 lectures, 1 laboratory. Prerequisite: PHYS 121.

### PHYS 123 College Physics (4)

GEB B.1.a.

Continuation of PHYS 121 and 122. Topics include electrostatics, electric current, magnetic fields and induction, elements of modern physics. Not open for credit to students having a grade of C or better in PHYS 133. 3 lectures, 1 laboratory. Prerequisite: PHYS 121. Recommended: PHYS 122.

### PHYS 131 General Physics (4)

GEB B.1.a.

Fundamental principles of mechanics: vectors, particle kinematics, statics and dynamics, equilibrium of a rigid body, work and energy, linear momentum, rotational kinematics and dynamics. Primarily for physical science, engineering, and architecture students. 3 lectures, 1 laboratory. Prerequisite: MATH 131 or concurrent enrollment in MATH 142; high school physics recommended.

### PHYS 132 General Physics (4)

GEB B.1.a.

Oscillations, waves in elastic media, sound waves, temperature, heat and the first law of thermodynamics, kinetic theory of matter, second law of thermodynamics, geometrical and physical optics. 3 lectures, 1 laboratory. Prerequisite: PHYS 131.

### PHYS 133 General Physics (4)

GEB B.1.a.

Charge and matter, electric field, electric potential, dielectrics, capacitance, current and resistance, electromotive force and circuits, magnetic fields, magnetic field of a moving charge, induced emf. 3 lectures, 1 laboratory. Prerequisite: PHYS 131, MATH 132 or MATH 142.

### PHYS 137 General Physics: Applied Physics for Architects (4)

Applied physics problems related to architecture including: damped, forced, and coupled oscillations in mechanical structures and electric circuits; earthquakes and structures; elementary electric circuit and wiring concepts; energy transport and efficient use of energy in buildings. For School of Architecture and Environmental Design majors. 3 lectures, 1 laboratory. Prerequisite: PHYS 132, MATH 142.

### PHYS 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

### PHYS 202 Physics and the Computer (2)

GEB B.1.a.

Microcomputers used to solve a variety of physics problems in the areas of optics, thermodynamics, mechanics, electricity and magnetism, astrophysics, and modern physics. 2 lectures. Prerequisite: PHYS 133, CSC 101 or CSC 110 or equivalent.

### PHYS 206, 207 Instrumentation in Experimental Physics (2) (2)

L-R-C circuits and electronic circuit elements emphasizing the applications of analog and digital electronics to instrumentation in modern physics. 2 lectures. Prerequisite: MATH 143, course in the use of Pascal or FORTRAN programming language, PHYS 133 and concurrent enrollment in PHYS 256, PHYS 257.

**PHYS 210 Introduction to Modern Physics (4)**

**GEB B.1.a.**

Fundamental principles of modern physics, emphasizing atomic and nuclear phenomena. Introduction to special relativity, wave particle duality, Bohr theory, radioactivity, interaction of radiation with matter, and nuclear reactions. 4 lectures. Prerequisite: PHYS 133 or EL 207 or PHYS 123 and MATH 132. Not open to students who have taken PHYS 211.

**PHYS 211 Modern Physics (4)**

**GEB B.1.a.**

Special relativity, fundamental principles of quantum mechanics, emphasizing the modern description of atomic phenomena. Kinetic theory, wave particle duality, Bohr theory, Schrodinger equation, elementary atomic structure. 4 lectures. Prerequisite: PHYS 133 or EL 207 or equivalent, MATH 133 or MATH 241.

**PHYS 213 Introduction to Nuclear Physics (3)**

**GEB B.1.a.**

Nuclear radiations and interactions. Detection methods, instruments and radioactive hazards. Nuclear reactions and induced radioactivity. Nuclear energy. 3 lectures. Prerequisite: PHYS 211.

**PHYS 215 Physics of Sound and Music (3)**

**GEB B.1.a.**

Wave nature of sound; musical instruments and production of sound, overtones and tone quality, musical scales; decibels and noise hazards; speech and hearing; recording and reproduction of sound; electronic instruments and synthesizers; room acoustics. 3 lectures. Prerequisite: Any PHYS or PSC course that deals with waves and sound.

**PHYS 243 Introductory Nuclear Physics Laboratory (1)**

**GEB B.1.a.**

Techniques of nuclear radiation detection and measurement including Geiger, proportional and scintillation counting. Properties of alpha, beta and gamma radiation. 1 laboratory. Prerequisite or concurrent: PHYS 210 or PHYS 213, PHYS 256 or equivalent.

**PHYS 256, 257 Electrical Measurements Laboratory (1) (1)**

Experimental studies of circuit analysis and electronics; introduction to digital techniques; instrumentation. 1 laboratory. Prerequisite: PHYS 133, MATH 143, and concurrently PHYS 206, PHYS 207.

**PHYS 301 Thermal Physics I (3)**

**GEB B.1.a.**

Thermodynamics and statistical mechanics. Entropy, temperature, chemical potential, free energy. Selected applications including paramagnetism, ideal gas, Fermi-Dirac distribution. 3 lectures. Prerequisite: PHYS 132, PHYS 210 or PHYS 211, MATH 241.

**PHYS 302 Analytic Mechanics (3)**

**GEB B.1.a.**

Vector analysis, laws of motion, kinematics and dynamics of a particle. Work and energy. Oscillatory motion (damped and forced oscillation). Center of mass. Linear and angular momentum. 3 lectures. Prerequisite: PHYS 131, MATH 242.

**PHYS 303 Analytic Mechanics (3)**

Dynamics of a rigid body. Three-dimensional motion of a rigid body, introduction to Lagrange's and Hamilton's equations. Miscellaneous course fee required—see *Class Schedule*. 3 lectures. Prerequisite: PHYS 302, concurrent MATH 304.

**PHYS 310 Physics of Energy (3)**

**GEB B.1.a.**

Physics and mathematics applied to broad energy topics. Conservation, transportation, solar energy, nuclear fission, breeder reactors, plasma fusion, laser fusion and separation, hydrogen economy, fuel cells, wind wave, tidal, and geothermal energy, transmission, storage, fossils, magnetohydrodynamic generators, and national planning. 3 lectures. Prerequisite: PHYS 133.

**PHYS 313 Introduction to Atmospheric Physics (3)**

**GEB B.1.a.**

Properties of the atmosphere. Atmospheric motions. Solar and terrestrial radiation; atmospheric scattering, optics, elements of radiative heat transfer and cloud physics. Description of the upper atmosphere. 3 lectures. Prerequisite: PHYS 132 or PHYS 122 and MATH 143 or MATH 133 or equivalent.

**PHYS 315 Introduction to Lasers and Laser Applications (3)**

**GEB B.1.a.**

Interaction of radiation with matter, theory of laser action, characteristics and modification of laser output, types of lasers. Holography and other applications. 3 lectures. Prerequisite: PHYS 133 or EL 207 or equivalent, or PHYS 123 with MATH 133 or MATH 143.

**PHYS 317 Special Theory of Relativity (3)****GEB B.1.a.**

Fundamental experiments and basic postulates of special relativity. Simultaneity, length and time measurements. Lorentz transformations. Four- Vectors. Space-time diagrams. Relativistic mechanics and electromagnetism. 3 lectures. Prerequisite: PHYS 210 or PHYS 211.

**PHYS 323 Optics (4)****GEB B.1.a.**

Maxwell's electromagnetic equations, light as an electromagnetic wave, refraction and geometrical optics, lenses and lens systems, polarization, interference, diffraction. 3 lectures, 1 laboratory. Prerequisite: PHYS 133, MATH 241.

**PHYS 341, 342 Quantum Physics Laboratory (1) (2)****GEB B.1.a.**

Experimental studies of particles and radiation, their quantum properties and interactions with atoms and nuclei. 1 laboratory, 2 laboratories. Prerequisite: PHYS 243.

**PHYS 363 Undergraduate Seminar (2)**

Study and oral presentation of current developments in physics. Discussion of projects and research by students and faculty. 2 seminars.

**PHYS 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigations, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department chair.

**PHYS 401 Thermal Physics II (3)**

Additional topics in thermodynamics and statistical physics, including chemical equilibrium, phase transitions, transport processes, and cryogenics. 3 lectures. Prerequisite: PHYS 301.

**PHYS 403 Nuclear Physics (3)****GEB B.1.a.**

Nuclear reactions. Structure of the nucleus. Nuclear energy levels. Radioactive decay processes. Nuclear fission. Nuclear spin and magnetic moment. Elementary particles. 3 lectures. Prerequisite: PHYS 213, PHYS 405.

**PHYS 405 Quantum Mechanics (3)**

Wave nature of matter. Wave function and its interpretation. The Schroedinger equation. Solutions for one dimensional problems and the one electron atom. 3 lectures. Prerequisite: PHYS 211; MATH 242. Recommend: MATH 304.

**PHYS 406 Solid State Physics (3)**

Crystalline structure of solids. Vibrational and electronic energies in the crystal lattice. Electrical, thermal, and magnetic properties of metals, insulators, and semiconductors. 3 lectures. Prerequisite: PHYS 405.

**PHYS 407 Quantum Mechanics (3)**

Electron spin and Pauli spin matrices. Matrix mechanics. Total angular momentum. Perturbation theory. Radiative transitions. Identical particles. 3 lectures. Prerequisite: PHYS 405.

**PHYS 408, 409 Electromagnetic Fields and Waves (4) (3)**

Electric and magnetic field theory using vector analysis. Electric fields, dielectric materials, magnetic fields, induced emf's, magnetic materials, Maxwell's equations, wave equations, plane electromagnetic waves. Dipole radiation, radiation from an accelerated charge. 4 lectures, 3 lectures. Prerequisite: MATH 304, PHYS 206, PHYS 207 or consent of instructor.

**PHYS 410 Physics of the Solid Earth (3)****GEB B.1.a.**

Gravity and the figure of the earth. Body wave seismology, structure and composition of the earth, heat flow and heat sources, earth tides, rotational dynamics, the geomagnetic field and its source, paleomagnetism. 3 lectures. Prerequisite: PHYS 133 and MATH 242 or equivalent.

**PHYS 412 Solid State Physics for Engineers (3)****GEB B.1.a.**

Basic quantum mechanics. Application to atomic structure and bonding. Crystal structures and their determination. Elementary treatments of Fermi statistics, free electron theory and band theory of solids, bulk properties of metals and semiconductors. Application to optical properties of solids and to selected current topics of interest (lasers, superconductivity, etc.). 3 lectures. Prerequisite: PHYS 211.

**PHYS 413 Advanced Topics in Solid State Physics (3)**

Lattice dynamics, tunable lasers, nonlinear optics, band theory, transport phenomena. Properties of superfluids and conductors, current experimental techniques. Review of the present state of the art from journal articles. 3 lectures. Prerequisite: PHYS 406, PHYS 412, or consent of instructor.

**PHYS 416 Theoretical Acoustics (3)**

Mathematics-based theoretical treatment of vibrations and normal modes; wave equation and solutions; radiation from vibrating sources, resonators and filters; impedance; decibel scale; speech, hearing and psychological acoustics. 3 lectures. Prerequisite: PHYS 132 and MATH 318.

**PHYS 423 Advanced Optics (3)**

Lens aberrations, interference and diffraction, Fourier optics, quantum optics, image formation and holography, non-linear optics. 2 lectures, 1 activity. Prerequisite: PHYS 323.

**PHYS 444 Theoretical Physics (3)**

Contour integration in the complex plane, properties of the delta function, properties of some common functions of theoretical physics, Green's function techniques for solving differential equations. 3 lectures. Prerequisite: MATH 304, MATH 242, MATH 319, PHYS 133.

**PHYS 452 Solid State Physics Laboratory for Engineers (1)**

Selected experiments on the solid state of matter using electrical, optical, and x-ray methods. 1 laboratory. Prerequisite or concurrent: PHYS 412.

**PHYS 456 Solid State Physics Laboratory (1)**

Experimental study of the solid state of matter using X-ray, electrical and optical methods. 1 laboratory. Prerequisite or concurrent: PHYS 406. Prerequisite: PHYS 341 or consent of instructor.

**PHYS 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**PHYS 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**PHYS 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**PI—POULTRY INDUSTRY****PI 121 Poultry Industry Development (4)****GEB F.2.**

Scope and importance of the poultry industry as a part of California agriculture. Poultry organizations, publications, employment opportunities. Basic skills in industry organization. 3 lectures, 1 laboratory.

**PI 122 Replacement Programs and Broiler Production (4)**

Organization and planning of the replacement program on the commercial poultry enterprise. Modern techniques and practices including costs, facilities, and management of replacement programs and broiler production. 3 lectures, 1 laboratory.

**PI 133 Poultry Incubation (3)**

Embryology fundamentals and metabolism of the developing embryo. Artificial incubation practices as applied in the commercial hatchery. Nutritional, genetic and environmental factors that affect the hatch. 2 lectures, 1 laboratory.

**PI 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**PI 221 Poultry Selection and Egg Production (3)**

Biological environmental factors that affect quality, size, and number of eggs produced. Techniques and practices of working with the commercial producing flock. 2 lectures, 1 laboratory.

**PI 222 Poultry Products, Processing and Marketing (3)****GEB F.2.**

Assembling, processing, distributing and merchandising of poultry meat and eggs. Standardization and regulations applicable to the marketing of poultry products. Development and promotion of consumer products. 2 lectures, 1 laboratory.

**PI 230 General Poultry Production (3)****GEB F.2.**

Survey of the various phases of the modern poultry industry including nutrition, breeding, flock health, production and management. Business aspects of poultry production and marketing of products. Not open to poultry majors. 2 lectures, 1 laboratory.

**PI 231 Poultry Anatomy and Physiology (3)**

Structural aspects and normal functions of the principal systems of domestic poultry. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

**PI 233 Poultry Plant Design and Equipment (2)**

Designing and planning a modern commercial poultry operation. Engineering of buildings and equipment to specific commercial functions. Coordination of buildings, equipment and operations designed for maximum plant efficiency. 1 lecture, 1 laboratory.

**PI 305 Game Bird Propagation and Management (3)****GEB F.2.**

Game bird anatomy, physiology and nutrition. Health, natural and artificial reproduction, and rearing techniques as practiced in public resource programs and private enterprises. 3 lectures. Prerequisite: One quarter college mathematics, one quarter animal biology and CHEM 121.

**PI 306 Game Bird Propagation and Management Laboratory (1)****GEB F.2.**

Field trips and basic skills in propagation and management in support of PI 305. 1 laboratory. Prerequisite or concurrent: PI 305.

**PI 322 Poultry Business Organization (4)**

Organization and management of a commercial poultry operation. Recruiting and supervising personnel, organizing flow of products and planning the distribution systems. Managing the finance, advertising, public relations, and sales phases of commercial poultry enterprise. 3 lectures, 1 laboratory.

**PI 323 Poultry Diseases and Hygiene (4)**

Management, sanitation and vaccinating programs for the maintenance of the flock health. Control and prevention of diseases and parasites. 3 lectures, 1 laboratory. Prerequisite: BACT 221.

**PI 331 Turkey Industry (3)**

Coordination and operation of a commercial turkey enterprise. Application of nutritional, breeding, disease control and marketing practices. Planning and supervising the specialized phases of the turkey enterprise. Development of new products and specialized marketing techniques. 2 lectures, 1 laboratory. Prerequisite: Consent of instructor.

**PI 333 Applied Poultry Feeding and Nutrition (4)**

Nutritional requirements, feeding principles and modern practices. Formulation of rations for specific purposes and commercial economy practices. Feed industry distributive procedures. 3 lectures, 1 laboratory. Prerequisite: DH 101, CHEM 326 or consent of instructor.

**PI 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**PI 422 Advanced Poultry Enterprise Supervision (3)**

Coordination and supervision of the modern commercial poultry enterprise. Analysis of operational procedures, efficiency practices, cost and quality control techniques. Interrelationship of business practices to the enterprise success. 3 lectures. Prerequisite: Consent of instructor.



**PI 431 Applied Poultry Breeding (4)**

Genetic applications in the development of commercial poultry stocks for specific productive designs. Application of commercial breeding techniques for flock improvement. Analysis of breeding records. 3 lectures, 1 laboratory.

**PI 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**PI 463 Undergraduate Seminar (2)**

Preparing and presenting in an organized manner reports on new trends, special problems, research developments related to the poultry industry. Group discussion of industry special problems. 2 seminars.

**PI 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**PI 581 Graduate Seminar in Poultry (3)**

Current trends and characteristics of the poultry industry enterprise. Group discussion of skills, techniques and practices to improve teaching of vocational agriculture as it applies to poultry. 3 seminars.

## **POLS—POLITICAL SCIENCE**

**POLS 100 Introduction to Political Science (3)**

Introduction to the scope, language, concepts and approaches of the discipline of political science. 3 lectures.

**POLS 102 California Government (3)**

California and local political institutions. Processes, structure and function of policy making at the state and local level. 3 lectures.

**POLS 105 Introduction to International Relations (3)**

Introduction to dynamics, character and substance of power relations among nations; conflict and accommodation, including the nature of the state and the international community. 3 lectures.

**POLS 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**POLS 204 Basic Concepts of Political Thought (3)**

Introduction to major concepts (such as authority, equality, force, individual, justice, law, political obligation, power, rights, state) which affect our thinking about social relations. Social and political theories of thinkers from Socrates to Machiavelli. 3 lectures.

**POLS 206 Judicial Process (3)**

Examination of the legal process with emphasis on the social and political influences affecting the law and its enforcement. Topics considered include types of law, the structure of the judicial system including Supreme Court decision making, police, judges and lawyers. 3 lectures.

**POLS 210 American and California Government (3)**

**GEB D.1.**

Origin, nature, and distribution of political power. Declaration of Independence. Constitution of the United States. Function and current problems of national, state and local government. Finding and evaluating authoritative source materials on political affairs. Completion of POLS 210 will satisfy the California state requirements in the United States Constitution, state and local government. 3 lectures.

**POLS 212 Comparative Politics (3)**

Comparative study of the government of the United Kingdom and other selected Western European countries. 3 lectures. Prerequisite: POLS 210.

**POLS 250 Model United Nations (2)**

Preparation for participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statements suitable for use in mock United Nations sessions. May be repeated to six units. 2 lectures. Prerequisite: One course in POLS or consent of instructor.

**POLS 303 Minority Group Politics (3)**

Analysis of political factors affecting minority groups in America. Involvement, organization and role of minority groups in the political process. Emphasis on the political behavior of black and chicano minorities. 3 lectures. Prerequisite: POLS 210.

**POLS 304 Politics of Global Survival (3)**

Inquiry into the political options available to the human race in dealing with such interrelated subjects as population, hunger, urbanization, energy, the environment, endangered species, and climate. 3 lectures. Prerequisite: POLS 210.

**POLS 305 Political Analysis (5)**

Introduction to methodology research design and quantitative methods used in survey research and political analysis. Bi-variate inferential statistics and elementary computer programming in SPSS will be used to analyze political phenomena. 3 lectures, 2 laboratories. Prerequisite: POLS 100, STAT 211.

**POLS 306 Modern Political Thought (3)**

Theories of political control and the relationship between man and the state. 3 lectures. Prerequisite: POLS 210.

**POLS 307 American Political Thought (3)**

Central political ideas of America's leading thinkers from Thomas Paine to the present. 3 lectures. Prerequisite: POLS 204, POLS 210.

**POLS 308 Revolutions and Collective Violence (3) (Also listed as SOC 308)**

Causes, methods, outcomes of and authority responses to collective violence and revolutionary movements. Contemporary events including terrorist and other forms of collective violence in industrialized and developing nations. 3 lectures. Prerequisite: One course in sociology or political science or consent of instructor.

**POLS 310 Jurisprudence (3)**

Science of law as developed in the Western legal tradition. Definitions of laws and their implications for such associated legal concepts as justice, rights, punishment, causation and responsibility. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 311 Inter-American Relations (3)**

Inter-American affairs. Political, economic, and social problems; forces motivating cultural behavior, industrial development, trade techniques, agriculture methods. Opportunities for employment in agriculture, engineering, and business. Finding and evaluating authoritative source materials on Latin American affairs. 3 lectures. Prerequisite: POLS 210, HIST 204.

**POLS 312 International Politics (3)**

International political processes and problems; foreign policies and politics in relations between states; conflicts and adjustments. Analyses of selected problems. 3 lectures. Prerequisite: POLS 105.

**POLS 313 National Security Policy (3)**

Theoretical approaches to the study of war and peace and the evolution of contemporary defenses and strategies, especially those pertaining to the United States. Impact of national strategy on both national and international politics. 3 lectures. Prerequisite: POLS 105 or POLS 210 or advanced standing in ROTC.

**POLS 314 Public Administration (3)**

Development of the executive functions in government. Making and carrying out public policy by government in the United States. Survey of administrative concepts and cases. 3 lectures.

**POLS 318 Administrative Theory and Behavior (3)**

Conceptual examination of the theory and behavior of large and small bureaucracies. Role of the individual in the organization. Social, psychological and behavioral theories of organization. 3 lectures. Prerequisite: POLS 210, POLS 314.

**POLS 319 Public Personnel Administration (3)**

Processes of managing human resources in the public service. Theory and practice of personnel administration, civil service system. labor issues. 3 lectures. Prerequisite: POLS 210, POLS 314 or consent of instructor.

**POLS 321 American Constitutional Law (3)**

Basic principles of American constitutional law. Role of the Supreme Court as arbiter of separation of powers and federalism. 3 lectures. Prerequisite: POLS 102, POLS 210.

**POLS 322 Civil Liberties (3)**

Role of Supreme Court as interpreter of Constitutional rights and liberties, freedom of expression, civil and criminal procedural guarantees, search and seizure, due process, and equal protection of the laws. 3 lectures. Prerequisite: POLS 102, POLS 210.

**POLS 325 Public Policy Analysis (3)**

Methods of analyzing the actions or inactions of government. Techniques for evaluating the outputs and impacts of governmental policies. Comparisons of various domestic issue areas such as transportation, education, housing, welfare, and law enforcement. 3 lectures. Prerequisite: POLS 210.

**POLS 331 Political Parties and Interest Groups (3)**

Makeup and major functions of political parties. Role of political parties and special interest groups in a democracy. Degree of consensus and conflict between present day political parties and special interest groups in their attempts to influence public policy. 3 lectures. Prerequisite: POLS 210.

**POLS 332 Public Opinion and Political Participation (3)**

Origins and dimensions of public opinion. Focus on contemporary political campaigns and elections in the U.S. Impact of political ideology, mass media, high technology, pressure groups on electoral outcomes. Voting behavior and other forms of political participation in the U.S. 3 lectures. Prerequisite: POLS 210.

**POLS 335 Legislative Process (3)**

Organization and procedures of Congress, state and local legislative bodies, theory and practices of representative government. Problems of representation in selected political systems. 3 lectures. Prerequisite: POLS 210.

**POLS 340 Government Internship (1-12) (CR/NC)**

Supervised work experience in a government or related public agency as approved by the school dean. Intern will function as an employee subject to all the duties and responsibilities of employees engaged in comparable work. 30 hours of work experience per unit of credit. Maximum of 4 units of credit per quarter except for full-time assignments in Sacramento, Washington, D.C. or equivalent. Credit/No Credit grading. Recommended preparation: Junior standing with a minimum 2.5 GPA.

**POLS 342 The American Presidency (3)**

Nature and problems of contemporary presidential leadership emphasizing the impact of bureaucracy, congress, public opinion, the courts, interest groups, and the party system upon the presidency and national policy making. 3 lectures. Prerequisite: POLS 210.

**POLS 350 Advanced Model United Nations (2)**

Participation in the campus Model United Nations. Procedure, MUN rules of debate, preparation of country positions, area papers, and policy statement for use in mock United Nations sessions. May be repeated to 6 units. 2 lectures. Prerequisite: POLS 250 or consent of instructor.

**POLS 370 Contemporary Global Political Issues (3)**

**GE B D.4.b.**

Coverage of current international political issues. Directed toward making students more aware of issues, problems, tensions in the international arena; relationship of the western and nonwestern countries to these issues, emphasizing both causes and effects. 3 lectures.

**POLS 371 World Food Politics (3)****GEB D.4.b.**

Self-reliant, food-first politics of the hungry poor in the less-developed countries; political support of food policies in the U.S. and other developed nations. Moral, ecological and commodity politics of food in a variety of cultural settings which direct food production, consumption and distribution and reduce food demand through population stabilization. 3 lectures. Prerequisite: Junior standing.

**POLS 380 Political Behavior (3)**

Political behavior of individuals and groups examined in light of biological, economic, psychological and social-psychological theories and research. 3 lectures. Prerequisite: POLS 210.

**POLS 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter.

**POLS 401 State and Local Government (3)**

Structure, function and problems of state, county, and local governments. 3 lectures. Prerequisite: POLS 210.

**POLS 402 Politics of Developing Areas (3)**

Process of political development in the Third World with appropriate examples taken from particular areas and countries. 3 lectures. Prerequisite: POLS 210.

**POLS 403 Municipal Government (3)**

Organization, politics, and problems of contemporary American municipalities. Trends in city life and government. 3 lectures. Prerequisite: POLS 102 or POLS 210.

**POLS 404 Science, Technology and Public Policy (3)**

Analysis of the problems stemming from the relationship of technology and politics. Ecology, energy crisis, civilian-military complex, electronic eavesdropping, governmental support of technology, policy implications of technological change. Individual's role and responsibilities in a democracy. 3 lectures. Prerequisite: POLS 210 or equivalent.

**POLS 405 Politics of Finance and Planning (3)**

Political and economic considerations affecting the decision-making process. Intergovernmental relations in finance, debt management. Appropriations and audits in government departments, commissions and government bodies. 3 lectures. Prerequisite: POLS 210 or consent of instructor.

**POLS 411 Contemporary U.S. Foreign Policy (3)**

Formulation and conduct of U.S. foreign policy. Analysis of the theory and elements of U.S. strategy; diplomacy, propaganda, economic operations, psychological warfare, and military strategies. 3 lectures. Prerequisite: POLS 105.

**POLS 417 Asian Politics (3)**

Analysis of political, economic, and social institutions and conditions in selected Asian nations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 418 Soviet Politics (3)**

Analysis of political, economic, and social institutions and conditions of the U.S.S.R. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**POLS 463 Undergraduate Seminar (3)**

Preparation and presentation of current developments in the field of political science. 3 seminars. Prerequisite: POLS 461, POLS 462 or consent of instructor.

**POLS 465 Middle Eastern Politics (3)**

Analysis of political, economic, and social institutions and conditions of the countries of the Middle East and North Africa. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 468 African Politics (3)**

Analysis of indigenous institutions, Western influences, and nationalism in Africa south of the Sahara. Selective area studies illustrative of colonialism and the politics of independence. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**POLS 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**POLS 510 Administration in Developing Nations (3)**

Processes of administration with reference to the differing cultural, political, and economic environments of the developing areas of the world. 3 seminars. Prerequisite: Graduate standing.

**POLS 590 Seminar in Political Science (3)**

Special problems in selected areas of Political Science. Each seminar will have a subtitle describing its nature and content. 3 seminars. Maximum of 6 units may be earned. Prerequisite: Graduate standing.

**PSC—PHYSICAL SCIENCE****PSC 101 The Physical Environment: Matter and Energy (4)****GEB B.1.a.**

Introduction to the basic principles of physical science and application of these principles in modern society. Objects at rest and in motion, energy and power, fluids, heat, light, and sound. 3 lectures, 1 laboratory.

**PSC 102 The Physical Environment: Atoms and Molecules (4)****GEB B.1.a.**

Introduction to the basic principles of the atomic, molecular, and sub-atomic behavior of matter, and applications of these principles in modern society. Electricity and magnetism, electrical nature of matter, organic and inorganic chemistry, modern physics, the nucleus. 3 lectures, 1 recitation. Prerequisite: PSC 101.

**PSC 103 The Physical Environment: Earth and the Universe (4)****GEB B.1.a.**

Introduction to the basic principles of the earth sciences and astronomy, and applications of these principles in modern society. Structure and formation of the earth, earthquakes, weather, oceanography, solar system, stars, and cosmology. 3 lectures, 1 recitation. Prerequisite: PSC 101.

**PSC 110 Energy for the Present and the Future (3)****GEB B.1.a.**

Detailed qualitative presentation of current and future energy sources along with the associated environmental problems. Energy production, energy consumption, energy conservation, fossil fuels, nuclear fission and alternative sources such as solar, geothermal and fusion energy. 3 lectures.

**PSC 171 Science and Society (3)****GEB B.1.a.**

Basic science and applied technologies of atomic and hydrogen weapons, the effects of nuclear war, missile systems, CBW weapons, nonproliferation, and verification technologies, along with their historical and treaty aspects. 3 lectures.

**PSC 201 Introduction to Physical Oceanography (3)****GEB B.1.a.**

Origin, extent of oceans; nature of sea bottom, sediments. Causes, effects of ocean circulation, tides and waves. Physical properties of sea water. Transmission of heat, sound and light. Shorelines and shoreline processes. One or two field trips. 3 lectures.

**PSC 303 Earth and Space Science (4)****GEB B.1.a.**

Concept oriented treatment of astronomy and space science, geology, oceanography, atmospheric physics, and meteorology designed for prospective elementary teachers. 2 lectures, 1 recitation, 1 activity. Prerequisite: PSC 101, PSC 102, consent of instructor.

**PSC 424 Organizing and Teaching of Physical Sciences (3)**

Techniques, aims and objectives in the teaching of physical sciences and general sciences at the secondary level. Selection and organization of teaching material. Evaluation of results. 3 lectures. Prerequisite: Evidence of satisfactory preparation in physics and chemistry.

**PSC 436 Demonstration Experiments in Physical Science (1)**

Investigation and illustration of the principles of physical science through demonstration experiments, designed and assembled by students according to their background and interest, largely from inexpensive, easily obtainable materials. Total credit limited to 2 units. 1 activity. Prerequisite: 6 quarter units of physical science.

**PSC 461 Senior Project (2)**

Selection and completion of a project under faculty supervision. Project results are presented in a formal report. Minimum of 60 hours total time.

**PSY—PSYCHOLOGY****PSY 104 Effective Study Techniques (2) (CR/NC)**

Designed to acquaint students with basic aims and objectives of going to college and to provide adequate instruction and practice in specific study skills such as: effective study methods, note-taking, time-planning, memory, concentration, reading and test taking. Credit/No Credit grading. 2 lectures.

**PSY 201 General Psychology (3)****GEB E.1.**

Introduction to the psychological study of human beings; applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. 3 lectures. A student may enroll for credit in either PSY 201 or PSY 202, but not both.

**PSY 202 General Psychology (3)****GEB E.1.**

Introduction to the psychological study of human beings; applications of research in psychobiology, perception, learning, motivation, consciousness, cognition, personality, emotion, development, psychological assessment, social behavior, psychopathology, and psychotherapy. 2 lectures, 1 recitation. A student may enroll for credit in either PSY 202 or PSY 201, but not both.

**PSY 212 Interpersonal Communication (3) (Also listed as SPC 212)**

Introduction to the interaction process through study of and practice in effective participation in group activities, self-disclosure, expressing points of view, active listening, sending responsible feedback and management of nonverbal behavior. 3 lectures.

**PSY 251 Laboratory in Group Activities (1–3) (CR/NC)**

Skills and techniques of solving problems in large and small groups; conducting and reporting meetings; analyses of leadership dynamics in campus organizations. Credit/No Credit grading. Total credit limited to 6 units. 1–3 activities.

**PSY 301 Psychology of Personal Development (3)**

Approaches to self-exploration and self-modification; conceptions of human potential; evaluation and development of personal effectiveness. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 302 Behavior in Organizations (3)**

Characteristics of functioning organizations and their effects on individuals. Psychological issues relevant to the maintenance of the organization; motivation, leadership, group phenomena, communication, decisionmaking, attitudes, personnel selection and organizational change. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 304 Physiological Psychology (3)****GEB E.2.**

Relationship between physiological and behavioral processes. Learning, motivation, emotion, perception, individual differences, social and abnormal behaviors as a function of the nervous and endocrine systems, sensory structures, genetic factors, effects of drugs. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 305 Human Sexuality (2) (CR/NC)**

Understanding aspects of personal sexuality. Sexual development, attitudes, gender identity, gender role, coercive sex, intimacy, biological aspects of sexuality, homosexuality, heterosexuality, sexual dysfunction, family planning and ethical issues. Credit/No Credit grading. 2 lectures.

**PSY 307 Abnormal Psychology (3)**

Abnormal behavior of individuals. Dynamics, etiology, symptoms, treatment and prevention of the more severe personality and behavior disorders. Includes organic mental disorders; substance abuse; psychoses; affective, anxiety, psychosexual, psychosomatic and personality disorders. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 309 Psychology of Consciousness (3)**

Characteristics and functions of selected, qualitatively unique patterns of consciousness such as hypnosis, meditation, dreaming, drug experiences and parapsychological phenomena, with particular emphasis on adaptive and maladaptive expressions of these states of consciousness. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 310 Death, Dying and Bereavement (3)**

Scientific and experiential investigations of dying and bereavement. Cross-cultural, historical, medical, legal, and developmental perspectives. Demography, care of the dying, grieving, funerals, search for immortality, megadeath, suicide, euthanasia. Meaning of life in the context of death. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 311 Environmental Psychology (3)**

Interrelationship between behavior and the built and natural environments. Evaluating and understanding environments, environmental stress, and the human aspects of environmental problems. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 314 Psychology of Women (3)**

Central issues in feminine psychology including stereotypes, gender differences, sex-roles, sex-typing, female sexuality, pregnancy and childbirth, women as victims, mental and emotional disorders of women, and aging. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 315 Psychology of Men (3)**

Central issues in male psychology including stereotypes, gender differences, sex-roles and their development, sex and role typing, male sexuality and models of masculinity. Health, mental and emotional disorders of men and aging. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 317 Psychology of Stress (3)**

Examines the present status of research in psychology on the relationship between stress and psychological and physical well-being; psychological factors influencing stress; description and critical evaluation of methods of stress reduction. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 320 Behavioral Effects of Drugs and Alcohol (3)**

Behavioral effects of the major categories of drugs. Factors influencing a person's choice to use and abuse drugs; personal and social consequences of drug abuse. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 330 Nonverbal Communication (3) (Also listed as SPC 320)**

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 3 lectures. Prerequisite: SPC 212 or consent of instructor.

**PSY 402 Social Psychology (3)**

Human behavior as it is influenced by other people and social situations. Socialization processes, attitude formation and change, aggression, behavior in groups, impression formation and factors involved in attraction, love and prejudice. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 432 Psychological Testing (3)**

Principles and procedures of selection, administration, scoring, and interpretation of achievement tests, aptitude tests including scholastic aptitude, interest inventories, and personality inventories. 3 lectures. Prerequisite: PSY 201 or PSY 202.

**PSY 452 Personality (3)**

Personality theories and research; human motivation and emotions; description and development of personality characteristics; adjustment and self-actualization. 3 seminars. Prerequisite: PSY 201 or PSY 202.

**PSY 453, 454, 455 Supervised Field Work (6) (6) (6) (Also listed as HD 453, 454, 454)**

Supervised field work experience in various community, governmental, and educational settings. Applied psychological, developmental, or educational experiences determined by participating institution, supervising faculty member, and student. Maximum of 6 units per quarter. Prerequisite: HD 230, HD 323, junior standing and consent of instructor.

**PSY 456 Behavioral Disorders in Children (3)**

Applications of psychological principles to childhood behavioral disorders: aggression, delinquency, stress reactions, motivational, perceptual-attentional deficiencies, psychoses, anxiety disorders, biological dysfunctions, and retarded social and cognitive development. 3 seminars. Prerequisite: PSY 201 or PSY 202, senior standing or consent of instructor.

**PSY 457 Leisure Counseling (3) (Also listed as REC 457)**

Philosophical, psychological, educational and practical aspects of leisure counseling. Historical foundations and leisure counseling models. 3 lectures. Prerequisite: REC 252 or consent of instructor.

**PSY 458 Learning and Memory (3)**

Principles of conditioning, motivation, verbal learning, observational learning, concept formation, language development, short-term and long-term memory; applications to problems such as behavior disorders, learning disabilities, mental retardation, drug abuse, aggression and prejudice. 3 seminars. Prerequisite: PSY 201 or PSY 202.

**PSY 459 Life Span Development (3)**

Theories of psychological development. Emphasis on developmental stages and corresponding tasks, emotions, and behaviors. Continuities and orderly sequences in development. 3 seminars. Prerequisite: PSY 201 or PSY 202, HD 108 or consent of instructor.

**PSY 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**PSY 565 Diagnosis and Treatment Planning (3)**

Review of formal and informal methods of assessment. Application of diagnostic models including DSM III to case studies, choice of appropriate intervention, development of treatment plan, and assessment of client change. Methods of documentation of assessment, diagnosis, treatment plan and evaluation. 3 seminars. Prerequisite: ED 555, ED 560, PSY 307, PSY 432.

**PSY 570 Selected Topics in Psychology and Human Development (3)**

Directed group study of selected topics for advanced students. Open to graduate students and selected seniors. *Class Schedule* will list topic selected. Total credit limited to 6 units. 3 seminars. Prerequisite: Graduate standing or consent of instructor.

**REC—RECREATION ADMINISTRATION****REC 100 Leisure Education and Lifestyle Management (2)****GEB E.2.**

Exploration of the impact of work, play, and leisure upon society. Analysis of theoretical views of play and the relationship of positive leisure values upon the development of a well-integrated lifestyle. Foundations for understanding and assessment of personal leisure well-being. 2 lectures.

**REC 101 Introduction to Recreation and Leisure Services (3)**

History, philosophy, theory, and community organization of recreation. Various agencies providing recreation and leisure services. Emphasis upon functions, areas, facilities, clientele, and career opportunities. Field visits required. 3 lectures.

**REC 102 Backcountry Ethics and Safety (2)**

Generalized outdoor course designed to prepare students for participation in the Outdoor Recreation Skill sequence. Wilderness and backcountry characteristics are reviewed in terms of potential hazards, safety precautions, and of the user's potential adverse impact on the environment. 2 lectures.



**REC 105 Recreation Leadership (3)**

Recreation leadership with small and large groups. Emphasis upon appropriate theories and techniques for specific clientele. 2 lectures, 1 laboratory.

**REC 210 Programming for Leisure (3)**

Methods of program planning, organization, implementation and evaluation in public and private settings; interrelationship of needs and interests of people, physical settings, and activity content; emphasis on program construction and scheduling. 2 lectures, 1 two-hour laboratory. Prerequisite: REC 101, REC 105 or consent of instructor.

**REC 245 Adaptive Aquatics in Physical Education and Recreation (2) (Also listed as PE 245)**

Adaptive techniques in working with the disabled in aquatics; physical, mental, emotional, social, and recreational involvements utilizing aquatics as the treatment modality. 1 lecture, 1 two-hour laboratory.

**REC 252 Recreation for People with Disabling Limitations (4)**

Adaptation of recreation and leisure services for persons with special needs or limitations; role of institutions and community agencies; specialized leadership techniques; modification requirements for programs, areas, facilities, equipment, and supplies. Field visits required. 3 lectures, 1 laboratory. Prerequisite: REC 210 or consent of instructor.

**REC 260 Intramural-Recreational Sports (3)**

Principles and policies underlying programs of intramural recreational sports in secondary schools and community centers. 2 lectures, 1 activity.

**REC 301 Outdoor Recreation Education (3)**

Seasonally selected outdoor leadership and skill development activities as specified by subtitle. Land, snow, and water based outdoor curriculum. May be repeated up to 9 units. Passing a basic proficiency test may be required. Field trips required. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 1 activity. Prerequisite: REC 102 or consent of instructor.

**REC 310 Program Administration in Leisure Services (3)**

Management of a full service program delivery system in a variety of settings: needs assessment, program selections, marketing and promotion of a full scope of services and seasonal evaluation. Field visits required. 3 lectures. Prerequisite: REC 210.

**REC 312 Employee Recreation (1)**

Administrative patterns, financing, programming staffing and legal concerns in programs designed for employee motivation and productivity. 1 seminar. Prerequisite: Junior standing or consent of instructor.

**REC 314 Travel and Tourism—Implications for Leisure (3)**

Trends of travel and tourism with specific emphasis on the Western United States and the international market. Travel motivations, settings involved in tourism development, travel research, and careers in tourism. Field visits required. 3 lectures. Prerequisite: Junior standing and consent of instructor.

**REC 316 Commercial Recreation Entrepreneurship (1) (CR-NC)**

Qualities of the entrepreneur. Management of a small commercial recreation business. Problems encountered by the commercial recreation entrepreneur. Small business management, budgeting and finance considerations. Credit—No Credit grading only. 1 seminar. Prerequisite: Junior standing or consent of instructor.

**REC 323 Supervisory Roles in Recreation Administration (3)**

Analysis of the supervisory roles in public, private, commercial and voluntary agencies offering organized leisure services. Methods, techniques, and evaluation systems. Field visits required. 3 lectures. Prerequisite: REC 210.

**REC 324 Organizational Patterns of Recreation Administration (3)**

Scope, levels, concepts, structure, and legal aspects of public, private, commercial and voluntary recreation and leisure services agencies. Emphasis upon the development of a professional philosophy. Field visits required. 3 lectures. Prerequisite: BUS 101, REC 101, REC 105, REC 210.

**REC 328 Aging and Leisure (3)**

Analysis of the psycho-social aspects of aging as related to leisure and recreation; physiological responses to leisure activity; special precautions and activity adaptations. Field visits required. 3 lectures. Prerequisite: REC 252 or consent of instructor.

**REC 329 Interrelationship of Treatment Services (3)**

Identification and definition of disciplines serving on the treatment team; analysis of factors which promote cooperation among team members and maximize effectiveness of services to clientele. 3 lectures. Prerequisite: REC 252 or consent of instructor.

**REC 337 Implementation of Outdoor Recreation Programs (3)**

Implementation of leisure programs in organized camps and related settings. Qualifications and duties of outdoor recreation personnel; professional opportunities in the field. 2 lectures, 1 two-hour laboratory. Prerequisite: REC 301 or consent of instructor.

**REC 352 Recreation Therapy (4)**

Philosophy, principles, and techniques in the use of recreation as a treatment modality in rehabilitating people with illness or disabling limitations. Sociological foundations of recreation and leisure in the community and implications for the exceptional individual. Role of recreation in total rehabilitation process of various agencies. Field visits required. 3 lectures, 1 laboratory. Prerequisite: REC 252 or consent of instructor.

**REC 364 Commercial Recreation and Leisure Services (3)**

Analysis of the types of commercial and private recreation enterprises; probable trends and directions; requirements and procedures for planning and organizing commercial recreation services. Field visits required. 2 lectures, 1 activity. Prerequisite: BUS 101, REC 210.

**REC 369 Research in Recreation Administration (3)**

Research design and methods; questionnaire and interview schedule construction, sampling, methods, data array and analysis. Discussion of potential senior project topics. 3 lectures. Prerequisite: SOC 333, STAT 212 and junior standing.

**REC 400 Special Problems For Advanced Undergraduates (1-3)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 6 units with a maximum of 3 units per quarter. Prerequisite: Consent of curriculum coordinator.

**REC 416 Physical Education/Recreation Facilities (3) (Also listed as PE 416)**

Management, clientele considerations, facilities and outdoor areas planning and operations, personnel, finance, and equipment as related to physical education and recreation areas and facilities. Field visits required. 3 lectures. Prerequisite: Upper division standing and consent of instructor for non-PE/REC majors.

**REC 424 Management of Recreation and Leisure Services (3)**

Roles of management: financing, managing and marketing leisure services; emphasis on budgeting, and community relations. Field visits required. 3 lectures. Prerequisite: REC 324.

**REC 430, 431 Directed Field Experience (3) (3)**

Practical work experience in related phases of recreation administration in organization or agency approved by curriculum coordinator. 200 hours required in field for each course. Individual conferences as required. Prerequisite: REC 103, REC 252, REC 323, REC 324, REC 364, senior standing, approval of curriculum coordinator. Therapeutic Recreation students also must have completed concentration courses prior to selection of and placement in a California Board of Park and Recreation Personnel (CBPRP) approved site which employs a Therapeutic Recreation Specialist certified by the National Council for Therapeutic Recreation Certification (NCTRC).

**REC 432 Internship (6)**

Directed full-time professional experience in a recreation agency. Comprehensive exposure to agency's resources and program. Individual development in program planning, conduct and evaluation; budget and finance, legal aspects, community and public relations. Prerequisite: REC 252, REC 301, REC 323, REC 324, REC 364, senior standing, 2.50 GPA overall, approval of curriculum coordinator. Therapeutic Recreation students also must have completed concentration courses for placement in California Board of Park and Recreation Personnel (CBPRP) approved site which employs a Therapeutic Recreation Specialist certified by the National Council for Therapeutic Recreation Certification (NCTRC).

**REC 457 Leisure Counseling (3) (Also listed as PSY 457)**

Philosophical, psychological, educational and practical aspects of leisure counseling. Historical foundations and leisure counseling models. 3 lectures. Prerequisite: REC 252 or consent of instructor.

**REC 461, 462 Senior Project (3) (2)**

Selection and completion, under faculty supervision, of an investigative project typical of problems which graduates must solve in their fields of employment. Required minimum of 150 hours. Analytical, formal report is required. Prerequisite: Senior standing and completion of REC 369.

**REC 464 Delivery of Commercial Recreational Services (3)**

Requirements and procedures for opening, operating, and evaluating commercial recreation enterprises. 2 lectures, 1 laboratory. Prerequisite: REC 364 or consent of instructor.

**REC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**REC 471 Selected Advanced Laboratory (1-3)**

Directed group laboratory study of selected topics for advanced students. Open to graduate and undergraduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**SCM—SCHOOL OF SCIENCE AND MATHEMATICS****SCM 100 Orientation to the School of Science and Mathematics (2) (CR/NC)**

Application of learning strategies, problem-solving methodologies, academic planning and career selection for students in the science and mathematics disciplines. Concurrent enrollment in specific orientation or content course is desirable. 1 lecture, 2 one-hour activities.

**SOC—SOCIOLOGY****SOC 105 Introduction to Sociology (3)****GEB D.4.a.**

Orientation to the nature of the study of society; survey of approaches to social analysis. Emphasis upon primary concepts describing environment, social structure, and social change for increased understanding of human relations. An overview of the systems of social relationships. 3 lectures.

**SOC 106 Social Problems (3)**

Appraisal of various factors from which the social problems of contemporary American society emerge and alternative procedures for dealing with such problems. 3 lectures.

**SOC 205 Sociology of Popular Culture (3)**

Investigation of the social content of radio, television, popular literature, motion pictures, popular music, and other relevant popular art forms. Analysis of these art forms as they mirror and influence contemporary social themes in the United States. 3 lectures. Prerequisite: One sociology course or consent of instructor.

**SOC 206 Sociology of Family Life (3)**

Description and analysis of the social relationships within the family group. Examination of alternative solutions to problems which arise in family living. 3 lectures.

**SOC 301 Social Work in the U.S.A. (3)**

Introduction to the field of social welfare; the development of American social work; scope and diversity of specific programs designed to meet welfare problems in contemporary society. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 302 Social Welfare Institutions (3)**

Development of public welfare services; current problems and policy issues; analysis of current programs of social insurance, public assistance programs; interagency relationships. 3 lectures. Prerequisite: SOC 301 or consent of instructor.

**SOC 305 Sociology of Social Movements (3)**

Analysis of the causes and impact of social movements, with a focus on the contemporary world. Included in this analysis are events ranging from riots, lynchings and panics to political, religious and racial social movements. 3 lectures. Prerequisite: Three units of sociology or consent of instructor.

**SOC 308 Revolutions and Collective Violence (3) (Also listed as POLS 308)**

Focus on the causes, methods, outcomes of and authority responses to collective violence and revolutionary movements. Contemporary events including terrorist and other forms of political violence in industrialized and developing nations. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 309 World System and Its Problems (3)****GEB D.4.b**

Analysis of the world system, its structure, its effects upon developed and developing nations, and the relations among the nations. 3 lectures. Prerequisite: Junior standing or consent of instructor.

**SOC 310 Socialization: Self, Organizations and Society (3)**

Analysis of social interaction relating to development of self; reciprocal influences between individuals, organizations and society. Development of social roles and the symbolic nature of interaction. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 311 Sociology of Sex Roles (3)**

Description and analysis of sex roles in modern society. Special attention given to the learning process and how sex stereotypes affect individuals' life chances and the social structure. Exploration of the sociobiological bases of sex role differentiation in societies. 3 lectures. Prerequisite: One course in Sociology or consent of instructor.

**SOC 313 Urban Sociology (3)**

Structure of social relationships in the community; physical structure of communities; patterns of community cooperation and conflict; changing patterns of urban community life; social class and political influence on the community level. 3 lectures. Prerequisite: One sociology course or consent of instructor.

**SOC 315 Race Relations (3)****GEB D.4.b.**

Diverse structures of unequal relationships among racial and ethnic groups in several countries. Theories about sources of economic and social discrimination. Evaluation of methods to restructure race and ethnic relations. International case histories. 3 lectures. Prerequisite: Junior standing.

**SOC 316 American Minorities (3)**

Problems in assimilation of the Afro-American, Mexican-American, and American Indian. Analysis of internal group structures and external factors impeding assimilation of these minorities. Dynamics of intergroup relationships. Assessment of current programs aimed at assimilation. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 323 Social Stratification (3)**

Social class and the distribution of status and power in society, with emphasis on contemporary United States; social mobility; relationships of stratification to mental illness, race, family systems, crime and delinquency, etc. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 326 Sociology of Aging (3)**

Age as a social phenomenon. Roles of the elderly in industrial societies. Changes in social structures and people as the shift occurs from middle to older age. Sociological theories about aging. Implications of an aging population. Public policies and aging. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 330 Social Change (3)**

Description and analysis of social change in contemporary American society as it relates to major revolutionary changes in this century; variables alleged to affect social change; impact of social change upon traditional societies; prospects for future social change. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 333 Social Research Methods I (3)**

Survey research experimentation, field research and content analysis as research techniques. Relationship between theory and research conceptualization and operationalization. Basic sampling techniques. Approaches to interviewing. 3 lectures. Prerequisite: Two sociology courses and STAT 211 or consent of instructor.

**SOC 334 Social Research Methods II (3)**

Univariate and multivariate data analysis using packaged statistical computer programs. Scale and index development. Casual analysis. 2 lectures, 1 laboratory. Prerequisite: SOC 333.

**SOC 344 Sociology of Poverty (3)**

Variable indicators of poverty in modern society. Chief features of the subculture of the poor. Analysis of different explanations for the persistence of poverty. Survey of proposals for reducing poverty. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 350 Social Organization of Modern Japan (3)**

Social and cultural features of modern Japan. Japanese group processes. Investigation of contemporary Japanese institutions: family, education, mass media, industry, politics, including an overview of popular culture. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 377 Medical Sociology (3)**

Analysis of the organization and operation of modern medicine emphasizing the interplay of several roles in medical practice. Interplay between organized and unorganized medicine, the health professions, and other structures of modern society. 3 lectures. Prerequisite: One course in sociology, or consent of instructor.

**SOC 395 Sociology of Complex Organizations (3)**

Bureaucracies and informal organizations from a sociological perspective. Organizational networks within and between organizations, relationship between organizations and their environment, and organizational socialization and career patterns. 3 lectures. Prerequisite: One course in sociology or consent of instructor.

**SOC 402 Crime and Delinquency (3)**

Theories of delinquent and criminal behavior; analysis of institutional and other approaches to rehabilitation of criminals and delinquents. 3 lectures. Prerequisite: Junior standing.

**SOC 412 Treatment of Criminals and Delinquents (3)**

Approaches to the control and rehabilitation of adult and juvenile offenders; philosophy of treatment strategies; history and analysis of probation, imprisonment, parole and preventive programs. 3 lectures. Prerequisite: SOC 402.

**SOC 413 Methods of Social Work (3)**

Theories, concepts, values stressed in social work. Social casework. Principles and practices used by social workers serving individuals and families in correctional, public assistance, medical, psychiatric youth services, and other settings. Discussion of case material and available literature. 3 seminars. Prerequisite: SOC 302.

**SOC 414 Social Work Practicum (3)**

Social-intervention practice model and its application. Social intervention goals and strategy. Social workers and social agencies. Professional social work skills in assessment, observation, interviewing, engagement, communication, and intervention activities. Reading and discussion of illustrative cases. 3 lectures. Prerequisite: SOC 301 and SOC 302 or consent of instructor.

**SOC 421 Social Theory (3)**

Concepts and theories in sociology, anthropology and geography. Modern and classical perspectives. Usefulness of theories for understanding present social problems. 3 lectures. Prerequisite: Two sociology courses or consent of instructor.

**SOC 431 Population Problems (3)**

Description and analysis of population variables and their sociological consequences. 3 lectures. Prerequisite: One sociology course and STAT 211 or consent of instructor.

**SOC 470 Selected Advanced Topics in Sociology (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**SOCS—SOCIAL SCIENCES****SOCS 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**SOCS 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**SOCS 424 Organizing and Teaching Social Sciences (3)**

Organization, selection, presentation, application, and interpretation of social sciences subject matter for teaching at the secondary level. 3 lectures. Prerequisite: Senior standing and/or consent of instructor.

**SOCS 440 Supervised Field Work (3)**

Supervised observation, research and work in community organizations, public agencies, etc., with attention to the barrio and ghetto. Prerequisite: Senior standing and/or consent of instructor. Total credit limited to 9 units.

**SOCS 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time. Prerequisite: Senior standing or consent of instructor.

**SOCS 463 Undergraduate Seminar (3)**

Intensive study of selected social problems with application of techniques for analysis. 3 seminars. Prerequisite: Senior standing or consent of instructor.

**SPAN—SPANISH****SPAN 101, 102, 103 Elementary Spanish (5) (5) (5)****GEB C.3.**

For beginners. Class practice in pronunciation, sentence structure, reading, writing, and basic conversation. Laboratory drill required. To be taken in numerical sequence. 4 lectures, 1 activity.

**SPAN 104 Intensive Elementary Spanish (15)**

Class practice in pronunciation, syntax, reading, writing, and conversation. Offered in summer only. Not open to students with credit in SPAN 101, 102, 103. Laboratory drill required. 12 lectures, 3 activities.

**SPAN 201, 202, 203 Intermediate Spanish (3) (3) (3)****GEB C.3.**

Review of Spanish grammar and practice in writing and oral expression based on social and cultural values. 3 lectures. Prerequisite: SPAN 103 or consent of instructor. Concurrent enrollment in SPAN 221, SPAN 222, SPAN 223 recommended.

**SPAN 204 Intensive Intermediate Spanish (9)**

Review of grammar and practice in written and oral expression based on social and cultural values. 9 lectures. Prerequisite: SPAN 103 or SPAN 104 or permission of instructor.

**SPAN 221, 222, 223 Spanish Conversation (2) (2) (2)**

Current idiomatic usage with emphasis on contemporary culture. Written compositions to supplement intensive oral classroom practice. 2 lectures. Prerequisite: SPAN 103 or consent of instructor. Concurrent enrollment in SPAN 201, 202, 203 is recommended.

**SPAN 301 Advanced Spanish Composition and Grammar (4)**

Oral and written development of structural grammar, syntax, and complex components of Spanish. Vocabulary expansion and idiomatic construction. Written composition. Translations to examine linguistic and semantic differences. 3 lectures, 1 activity. Prerequisite: SPAN 203 or equivalent.

**SPAN 302 Advanced Spanish Conversation and Grammar (4)**

Topics based on student interest. Outlines and/or abstracts constitute written assignments. Individual presentations to elicit spontaneous response. Group presentations to allow cooperative research and preparation. 4 lectures. Prerequisite: SPAN 203, SPAN 223, equivalent, or consent of instructor.

**SPAN 305 Significant Writers in Spanish (4)****GEB C.3.**

Selected Spanish writers, as individual writers or in groups. 4 lectures. May be repeated to 12 units. Prerequisite: SPAN 203 or equivalent.

**SPAN 323 Spanish Phonetics (3)**

Spanish sound system; acoustic and articulatory phonetics using the International Phonetic Alphabet and contemporary methods of linguistic analysis. 2 lectures, 1 activity. Prerequisite: SPAN 203 or equivalent, or consent of instructor.

**SPAN 330 Advanced Spanish Grammar for the Bilingual Student (4)**

Spanish-English contrastive analysis underlining linguistic and semantic differences and similarities. Discussion of inter-language interferences in vocabulary, spelling, grammar, and idiomatic expressions. Analysis of differences between Chicano, Mexican and standard international Spanish dialects. 4 lectures. Prerequisite: SPAN 203 or consent of instructor.

**SPAN 356 Advanced Spanish (3)**

"Explication de texte" applied to selected literary works of Spanish and Spanish-American authors. 3 lectures. Prerequisite: SPAN 203.

**SPAN 405 Hispanic Literature in English Translation (3)****GEB C.3.**

Selected works to be read by students in the original or in English translation. Critical analysis, interpretation, and comparison of individual works by outstanding Spanish writers. Lecture in English. For minor credit, reading and written assignments must be done in Spanish. *Class Schedule* will list topics selected. 3 lectures. Prerequisite: Consent of instructor.

**SPAN 470 Selected Advanced Topics (1-4)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 8 units. 1 to 4 lectures. Prerequisite: Consent of instructor.

**SPC—SPEECH COMMUNICATION****SPC 101 Professional Fields of Speech (1)**

Occupational opportunities, professional organizations, and important journals in the various fields of speech. Development and trends in forensics, discussion, theatre arts, and speech correction. 1 lecture.

**SPC 125 Critical Thinking (3) (Also listed as ENGL 125 and PHIL 125)****GEB A.2.**

Nature of critical thinking. Analysis of inductive and deductive arguments. Practice in the criticism and composing of arguments in English. 3 lectures. Prerequisite: ENGL 114.

**SPC 201 Public Speaking (3)****GEB A.3.**

Introduction to the principles and types of public speaking. Practical experience in the development, presentation, and critical analysis of speeches to inform, to persuade, and to actuate. Not open to students with credit in SPC 202. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**SPC 202 Principles of Speech (3)****GEB A.3.**

Introduction to the fundamentals and principles which underlie effective speech communication. Practical experience in various types of speaking situations: informative speaking, persuasive speaking, and panel discussion. Not open to students with credit in SPC 201. 3 lectures. Prerequisite: ENGL 125 or PHIL 125 or SPC 125.

**SPC 203 Voice and Articulation (3)**

Physiology of normal speech; assessment and improvement of students' vocal and articulation practices to enhance oral skills. 3 lectures.

**SPC 212 Interpersonal Communication (3) (Also listed as PSY 212)**

Introduction to the interaction process through study of and practice in effective participation in group activities, self-disclosure, expressing points of view, active listening, sending responsible feedback and management of nonverbal behavior. 3 lectures.

**SPC 213 Organizational Communication (4)**

Relationships of human behavioral dynamics within the organizational process. Functions of information networks in organizations. Role of leadership in the business-industrial context. 4 lectures.

**SPC 217 Small Group Communication (4)**

Basic principles and techniques of discussion. Survey of the importance of discussion in contemporary society, including study of and practice in informal group discussion, panel discussion, symposium, and forum. 4 lectures.

**SPC 250 Forensic Activity (1)**

Lower division participation in intercollegiate forensic activities. Any student who wishes to receive academic credit for participation in such activities during the quarter should enroll. Specific assignments will be determined by instructor. May be repeated to 6 units. 1 activity.

**SPC 300 Phonetics (3)**

Phonetic basis of speech sounds in American English, their development, symbolization, production, and characteristics; practice in broad transcription, using the International Phonetic Alphabet. 3 lectures.

**SPC 301 Business and Professional Communication (3)**

Speech in industrial, professional, and informal business including interviews, sales talks, and conference speaking. Preparation of oral reports in business and professional situations. 3 lectures. Prerequisite: SPC 201 or SPC 202 or consent of instructor.

**SPC 302 Introduction to Communicative Disorders (4)**

Survey of speech, language, and hearing disorders emphasizing causes, symptoms, and treatment; role of the speech therapist in the community and in public schools; role of the classroom teacher in speech improvement. 4 lectures.

**SPC 303 Development of Speech and Language (3)**

Development of speech and language from birth to adolescence. Physical and psychological processes contributing to the emergence, practice, and mastery of speech and language. 3 lectures. Prerequisite: SPC 300, SPC 302.

**SPC 305 Oral Interpretation (4)**

Poetry, prose, nonfiction and dramatic literature through the individual performance. Literary works are performed as a critical act illuminating meanings within a text and conveying them to an audience. 4 lectures. Prerequisite: SPC 201 or SPC 202, 3 units of literature.



**SPC 310 Performing Literature in the Classroom (3)**

Techniques of oral interpretation; selection, preparation, and presentation of literature. Problems unique to story reading and telling, poetry and prose, choral reading and group performance in preschool through secondary levels. 3 lectures.

**SPC 312 Communication Theory (4)**

Concepts and theories of the human communication process. Psycho-sociological aspects of attitude change. Interpersonal relations in an informational-behavioral context. 4 lectures. Prerequisite: PSY 201 or PSY 202, SPC 212, consent of instructor.

**SPC 316 Cross-Cultural Communication (3)**

Examination and clarification of communication problems within and between ethnic groups. 3 lectures.

**SPC 320 Nonverbal Communication (3) (Also listed as PSY 330)**

Influence of kinesic, proxemic, artifactual, olfactory, paralinguistic and environmental factors in human communication. Theory, research and practice in nonverbal communication. 3 lectures. Prerequisite: SPC 212 or consent of instructor.

**SPC 322 Persuasion (4)**

Persuasive theory including methods of attention, suggestion, motivation, and adaptation employed to influence feelings, attitude, change and action. Analysis of persuasive discourse and the application of persuasive methods in speaking. 4 lectures. Prerequisite: SPC 201 or SPC 202.

**SPC 325 Argumentation (4)**

Techniques of argumentation, logic and reasoning; fallacies of reasoning; experience in various forms of formal argument, and evaluation systems. 4 lectures. Prerequisite: SPC 201 or SPC 202, SPC 125 or ENGL 125 or PHIL 125.

**SPC 330 Classical Rhetorical Theory (4)****GEB C.3.**

Early development of rhetorical theory in Greco-Roman civilization; analysis of the canons of rhetoric; rhetorical thought of Sophists, Isocrates, Plato, Aristotle, Cicero and Quintilian. 4 lectures. Prerequisite: ENGL 215.

**SPC 331 Contemporary Rhetorical Theory (4)**

Contemporary concepts of rhetoric. Contributions of Burke, Weaver, Richards, Toulmin and McLuhan. Issues: Ethics and communication, mass media, freedom of speech and dramatic theory. 4 lectures. Prerequisite: ENGL 215.

**SPC 350 Advanced Forensic Activity (2)**

Upper division participation in intercollegiate forensics. Administration and operation of tournaments held annually on campus and in the community. May be repeated to 6 units. 2 activities. Prerequisite: SPC 250.

**SPC 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of instructor.

**SPC 404 Communication in Children's Environments (4)**

Exploration of communication development, preschool and elementary school children; construction, presentation, and evaluation of appropriate instructional experiences; student-teacher-parent interaction. Communication style, environmental stimuli, dialectal differences and bilingualism, measurement of communication competence. 4 lectures.

**SPC 405 Interpreters Theatre (3)**

Examination of modes of group performance of literature; scripting, directing, performing and critiquing through Readers Theatre, Chamber Theatre and Story Theatre. 3 lectures. Prerequisite: SPC 305, or consent of instructor.

**SPC 411 Communication Research (4)**

Exploration of communication research strategies and methodologies. Basic methods of designing research in empirical communication studies. 4 lectures. Prerequisite: STAT 211, SPC 312.

**SPC 413 Advanced Organizational Communication (4)**

Describing and measuring the organization's human message system. Planning and implementing communication training and development for the organization. New functions, careers and opportunities for the communication professional. 4 lectures. Prerequisite: SPC 213 and SPC 301 or consent of instructor.

**SPC 430 Rhetorical Criticism (4)**

Theory and method used in the analysis and evaluation of rhetorical discourse. Study of critical essays. Practice in interpreting and evaluating persuasive discourse. 4 lectures. Prerequisite: SPC 330 or consent of instructor.

**SPC 435 Great Speeches (4)**

Selected speakers and speeches from the Greco-Roman era to the present. Analysis and discussion of oratory's role in the shaping of historical events and the development of civilization. 4 lectures. Prerequisite: SPC 430 or consent of instructor.

**SPC 450 Internship: Speech Communication (2-4) (CR/NC)**

Supervised practicum and application of principles and theories of speech communication in organizational settings. Credit/No Credit grading. Prerequisite: Junior standing, 2.5 GPA, and department head approval.

**SPC 460 Undergraduate Seminar (1)**

Discussion and design of individual projects, oral reports on material in current professional writings. 1 seminar. Prerequisite: Junior standing.

**SPC 461 Senior Project (3)**

Completion of approved project under faculty supervision. Project results are presented in a formal written report. Minimum 90 hours total time. Prerequisite: SPC 460.

**SPC 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**SPC 503 Psycholinguistic Disabilities (3)**

Identification, evaluation, and treatment of various types of language disorders including semantic, syntactic and pragmatic disabilities affecting both oral and written language processes. Organic, environmental, and emotional factors are stressed. 3 seminars. Prerequisite: SPC 303.

## **SS—SOIL SCIENCE**

**SS 100 Orientation in Soil Science (1)**

Understanding the depth and breadth of soils as a science. Examine potential career opportunities. Introduction to both student and professional organizations. 1 activity.

**SS 121 Introductory Soil Science (4)****GEB F.2.**

Biological, chemical, physical and genetic soil properties. Interpretation of soils information for agricultural management, and production; proper land use and conservation; and soil and water management. 3 lectures, 1 laboratory.

**SS 122 Soil Management (4)**

Effects of tillage, soil amendments, drainage, water quality, salinity and soil physical properties on agricultural production and land use capability interpretations. 3 lectures, 1 laboratory. Prerequisite: SS 121.

**SS 200 Special Problems for Undergraduates (1-2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**SS 202 Soil Conservation (3)**

Climate, topography, soils and land use in relation to soil and water losses. Evaluation of soil and water conservation programs and practices. Miscellaneous course fee required—see *Class Schedule*. 3 lectures. Prerequisite: SS 121 or consent of instructor.

**SS 221 Fertilizers (4)**

Plant nutrient requirements. Composition, value, and use of fertilizer materials, conditioners and agricultural minerals. Methods of manufacturing, distributing, and applying fertilizers. 3 lectures, 1 laboratory. Prerequisite: SS 121.

**SS 223 Soil Materials (4)**

Origin, composition, identification and weathering of rocks, minerals, and clays important in the development of soils. Parent materials as related to the nature and properties of soils. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

**SS 312 Agricultural Climatology (2)**

Influence of climate, climatic factors and the plant canopy microclimate on plant growth, and yield. Managing climatic factors for improving crop production. 2 lectures. Prerequisite: SS 121 and junior standing or consent of instructor.

**SS 321 Soil Morphology (4)**

Identification of soil horizons and morphological properties. Correlation of soil physical and chemical properties with landscapes and land use. Techniques of interpretations for agriculture, forest, range and urban development. Miscellaneous course fee required—see *Class Schedule*. 2 lectures, 2 laboratories. Prerequisite: SS 121.

**SS 322 Soil Fertility (3)**

Investigation and evaluation of the nutrient supplying ability of soils. Examination of the conditions and transformations involved in the transfer of mineral nutrients from the soil to the plant. Interpretation of data integrating soils, applied fertilizers and plant growth. 2 lectures, 1 laboratory. Prerequisite: SS 221, CHEM 122 or CHEM 128.

**SS 323 Soil Geomorphology and Mapping (3)**

Field study and identification of major landforms in the Western United States using topographic maps, aerial photographs and soil survey reports. Analyzing the soil distribution on these major landforms using soil mapping techniques. 2 lectures, 1 laboratory. Prerequisite: SS 321 or GEOL 201 or consent of instructor.

**SS 350 Computer Software Applications in Agronomy (2)**

Computer software applications for soil science and agriculture including word processing, data storage and manipulation, statistical analysis of data, graphics preparation and presentations. 1 lecture, 1 laboratory. Prerequisite: AM 250 or CSC 110 or consent of instructor.

**SS 400 Special Problems for Advanced Undergraduates (1–2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**SS 422 Soil Microbiology (3)**

Biochemical activities of soil organisms. Effect of soil organisms on the formation, characteristics, and productivity of soils. Methods of studying soil organisms. 2 lectures, 1 laboratory. Prerequisite: SS 221, BACT 221 or BACT 224, CHEM 328 or consent of instructor.

**SS 423 Soil Chemistry (4)**

Application of concepts in chemistry and clay mineralogy to the management, use and understanding of soils. Quantitative approach to understanding and altering the chemical environment in saline, sodic and acidic soils for optimizing their use. 3 lectures, 1 laboratory. Prerequisite: SS 322, CHEM 129.

**SS 431 Soil Taxonomy (2)**

Taxonomic classification for making and interpreting soil surveys. Defining the properties and limits that separate individual soils, and identifying combinations of these properties that can be observed in the field. 2 lectures. Prerequisite: SS 121, SS 321.

**SS 432 Soil Physics (4)**

Fundamentals of soil physical properties: structure, texture, water, air and temperature and their application to agricultural and engineering practices. 2 lectures, 2 laboratories. Prerequisite: SS 122, PHYS 104 or PHYS 121, CHEM 122, or CHEM 128, or consent of instructor.

**SS 433 Land Use Planning (3)**

Development of plans and practices for management of agricultural, recreational and urban land use by evaluating the soil capabilities through the use of Soil Survey Reports. 2 lectures, 1 laboratory. Prerequisite: SS 121.

**SS 440 Forest and Range Soils (4)**

Ecosystem approach to the chemical, biological, physical and mechanical properties of forest and range soils. Interpretation of specific research findings and their applications to management problems. Preparation of soil management reports similar to those required by various land management organizations. Field trips. Miscellaneous course fee required—see *Class Schedule*. 3 lectures; 1 laboratory. Prerequisite: SS 121.

**SS 453 Tropical Soils (4)**

Nature and properties of soils occurring in the tropics, their origin, morphology, classification, fertility, management and conservation. Examine social implications in international agriculture. 3 lectures, 1 laboratory. Prerequisite: SS 121, CHEM 122 or CHEM 128.

**SS 461 Senior Project (1)**

Senior project topic selection and contract development with project adviser. Statement of problems, subproblems, assumptions, objectives, hypothesis, methods of analysis and statistical design. Development of literature review and budget of time and finances. Proper format and presentation of tabular and graphic information.

**SS 462 Senior Project (4)**

Implementation of materials and methods. Collection, analysis and interpretation of data. Completion of formal written report under adviser supervision. Minimum 120 hours. Prerequisite: SS 461.

**SS 463 Undergraduate Seminar (2)**

Review of current research, experiments, and problems related to the student's major field of interest. Preparation and presentation of reports on problems or research activities. 2 seminars.

**SS 470 Selected Advanced Topics (1–3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**SS 471 Selected Advanced Laboratory (1–3)**

Directed group laboratory study of selected topics for advanced students. Open to undergraduate and graduate students. *Class Schedule* will list topic selected. Total credit limited to 6 units. 1 to 3 laboratories. Prerequisite: Consent of instructor.

**SS 501 Scientific Investigation (3)**

Problem solving and research planning for agriculture, natural resources and related sciences. Preparation of study plans which identify problems, review appropriate literature, formulate objectives, develop methods and provide for presentation and interpretation of results. 3 lectures. Prerequisite: Graduate standing or consent of instructor.

**SS 508 Landscape Management for Erosion Control (3)**

Techniques for the development of soil erosion control and the dispersal of surface runoff water on urban, industrial, recreational and dwelling sites. Land grading ordinances and their limitations. Miscellaneous course fee required—see *Class Schedule*. 3 lectures. Prerequisite: Introductory soils course and/or consent of instructor.

**SS 521 Soil Genesis and Classification (3)**

Morphological characteristics and genesis of soils and their relationship with major landform features. New techniques used in modern systems of soil classification and mapping. 2 lectures, 1 laboratory. Prerequisite: SS 321 or consent of instructor.

**SS 522 Advanced Soil Fertility (3)**

Current research frontiers in soil fertility. Evaluating soil testing philosophy, theories and interpretation; optimizing soil conditions for maximizing crop production; consequences of environmental pollution, trace elements and organic amendments; chemical reactions including solubility and chelate equilibria, adsorption phenomena, nutrient mobility, soil mineralogy and weathering; use of foliar fertilization; and radioisotopes in soil fertility. 3 lectures. Prerequisite: SS 322, graduate standing or consent of instructor.

**SS 581 Graduate Seminar in Soils (3)**

Current research, experiments and problems related to soil science. 3 seminars.

**SS 582 Advanced Land Management (3)**

Development of plans and practices for the management of crop, range, and wood land. 2 seminars, 1 laboratory. Prerequisite: Graduate standing, SS 433.

## STAT—STATISTICS

**STAT 200 Special Problems for Undergraduates (1–2)**

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**STAT 211 Elementary Probability and Statistics (3)****GEB B.2.**

Classification of statistical data; calculation and uses of various averages; measures of variability; elementary probability; binomial and normal distributions; random sampling, confidence intervals, introduction to hypothesis testing. Not open to students with credit for STAT 251 or STAT 321. 3 lectures. Prerequisite: Intermediate algebra or equivalent.

**STAT 212 Statistical Methods (3)****GEB B.2.**

Tests of hypotheses, and confidence intervals on common parameters; linear regression and correlation; multiple regression; analysis of variance; analysis of enumerative data; nonparametric methods. Not open to students with credit for STAT 252 or STAT 322. 3 lectures. Prerequisite: STAT 211.

**STAT 251 Statistical Inference for Management I (3)****GEB B.2.**

Descriptive statistics. Review of probability distributions. Point and interval estimation of common population parameters. Hypothesis tests of population means, proportions, and variances. Chi-square analysis. Use of calculators and minitab as computing tool. Not open to students with credit for STAT 211 or STAT 321. 3 lectures. Prerequisite: MATH 121.

**STAT 252 Statistical Inference for Management II (3)****GEB B.2.**

Regression, correlation, multiple regression, time series, and forecasting. Use of computers, batch and terminal, assumed throughout course. Experience with large statistical computer packages in analyzing information in data-bases. Not open to students with credit for STAT 212 or STAT 322. 3 lectures. Prerequisite: STAT 251 and CSC 120 or one course in computer programming.

**STAT 313 Design and Analysis of Experiments (3)**

Applications of statistics for students not majoring in statistics or mathematics. Analysis of variance including the one-way classification, randomized blocks, Latin squares, and factorial designs. Introduction to multiple regression and to analysis of covariance. Use of computer software in the solution of statistical problems. 3 lectures. Prerequisite: STAT 212.

**STAT 321, 322 Statistical Analysis (3) (3)****321: GEB B.2.**

Probability and probability distributions for statistical procedures. Statistical techniques based on sampling from normally distributed populations. Regression and correlation, introduction to analysis of variance, analysis of covariance, distribution free procedures. Use of computing facilities in the solution of statistical problems. Not open to students with credit for STAT 211, STAT 212, or STAT 251, 252. 3 lectures. Prerequisite: MATH 132 or MATH 142.

**STAT 323 Analysis of Variance (3)**

Single and two factor analyses of variance, fixed and random effects, Latin square and other special designs, nested designs, factorial designs and analysis of  $2n$  factorial experiments, analysis of covariance. 3 lectures. Prerequisite: STAT 322.

**STAT 324 Applied Regression Analysis (3)**

Simple linear regression, aptness of model, special topics in simple linear regression, multiple linear regression, indicator variables, selection of "best subset," and introduction to nonlinear regression models. 3 lectures. Prerequisite: STAT 212 or STAT 252 or STAT 322.

**STAT 330 Statistical Uses of Computers (3)**

Techniques available to the statistician for efficient use of a digital computer to perform statistical computations and to handle large amounts of data. Use of special languages. Analysis of computer software used in the solution of statistical problems. 3 lectures. Prerequisite: STAT 212 or STAT 252 or STAT 322, one course in computer programming.

**STAT 400 Special Problems for Advanced Undergraduates (1-2)**

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with not more than 2 units in any one quarter. Prerequisite: Consent of department head.

**STAT 415 Nonparametric Methods in Statistics (3)**

Hypothesis testing when the form of the parent population is unknown; tests based on Binomial Distribution; measures of dependence; contingency tables; tests based on ranks; Kolmogorov-Smirnov-type tests. 3 lectures. Prerequisite: STAT 212 or STAT 322.

**STAT 418 Topics in Multivariate Statistics (3)**

Either discrete or continuous multivariate statistics. Discrete multivariate statistics includes analysis of multidimensional contingency tables, log-linear and logit models, goodness of fit statistics, model building and hypothesis testing. Continuous multivariate statistics includes multivariate linear model, principal components and factor analysis, discriminate analysis, clustering and canonical correlation. Course may be taken twice for credit with permission of instructor. 3 lectures. Prerequisite: Two courses in statistics and MATH 204 or the consent of instructor.

**STAT 421 Sampling Techniques (3)**

Planning, execution, and analysis of sampling from finite populations. Sampling designs and estimation procedures. Nonsampling errors. Questionnaire analysis. Case studies. 3 lectures. Prerequisite: STAT 212, STAT 252, or STAT 322.

**STAT 423 Linear Models (3)**

General linear model—a unified approach to various applied methods. Regression, t-test, analysis of variance and covariance; programming statistical problems. Advanced topics in statistical designs; split plot design, confounding, fractional factorial, response surfaces. 3 lectures. Prerequisite: STAT 323, MATH 204.

**STAT 425 Probability Theory and Applications I (3)****GEB B.2.**

Basic probability theory, conditional and marginal probability, stochastic independence, probability models for random phenomena, probability distributions, mathematical expectation and transformation. 3 lectures. Prerequisite: STAT 321, MATH 241.

**STAT 426 Probability Theory and Applications II (3)**

Multivariate normal distribution, sampling distributions, theory of estimation and hypothesis testing. 3 lectures. Prerequisite: STAT 425.

**STAT 427 Mathematical Statistics (3)**

Investigation of statistical theory, including the topics of Bayesian inference, regression and linear hypotheses, and sequential analyses. 3 lectures. Prerequisite: STAT 426.

**STAT 461, 462 Senior Project (2) (2)**

Selection and completion of a project under faculty supervision. Projects typical of problems which graduates must solve in their fields of employment. Project results are presented in a formal report. Minimum 120 hours total time.

**STAT 463 Undergraduate Seminar (2) (CR/NC)**

Reports and discussions by students through seminar methods, based on topics of interest to persons preparing for a career in statistics. Offered only on a Credit/No Credit basis. 2 seminars.

**STAT 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**STAT 512 Statistical Methods (3)**

Statistical methods in research for graduate students not majoring in mathematical sciences. Probability distributions, confidence intervals, hypothesis testing, contingency tables, linear regression and correlation. Application of statistics in the student's major field. 3 seminars. Prerequisite: Intermediate algebra or equivalent.

**TH—THEATRE****TH 210 Introduction to Theatre (3)****GEB C.2.**

Play production process and approach to the theatre including theatrical terminology, methods, aesthetics and technology. 3 lectures.

**TH 327, 328 Theatre History and Literature (3) (3)****GEB C.3.**

History of theatre in the Western world and representative plays from the Greeks through the French Seventeenth Century, and from Eighteenth Century England to the present. 3 lectures. Prerequisite: TH 210 or consent of instructor.

**TH 330 Stagecraft (3)**

Scenery design, construction, painting, lighting, costumes, and make-up. 3 laboratories. Maximum of 9 units may be earned. Prerequisite: TH 210 or consent of instructor.

**TH 332 Stage Make-up (1)**

Contemporary theories and techniques in straight, character and corrective make-up for the stage, film and television. 1 activity.

**TH 340 Acting (3)**

Basic acting techniques, improvisation, characterization, pantomime and movement. 1 lecture, 2 activities. Prerequisite: TH 210 or consent of instructor.

**TH 342 Directing (3)**

Script analysis, motivation and blocking of action, preparation of the prompt book. Direction of practice scenes. 1 lecture, 2 activities. Prerequisite: TH 210 or consent of instructor.

**TH 345 Rehearsal and Performance (2)**

Preparation of a play for public presentation, including acting, stage management, publicity and house management. Admission to course by audition only. Maximum of 6 units credit may be earned. 2 laboratories.

**TH 380 Children's Drama (3)**

Role-playing, group dramatization, and related activities. For students preparing to teach. 1 lecture, 2 activities.

**TH 400 Special Problems for Undergraduates (1-2)**

Individual investigation, research, or project centering around theatre. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

**TH 430 Introduction to Stage Design: Scenery (3)**

Theories and contemporary practices in stage, film and television scenic design. Script analysis and production concept through shop plans, renderings, models. Property plots. Regularly assigned design projects, final portfolio preparation and presentation. 1 seminar, 2 laboratories. Prerequisite: TH 330 or consent of instructor.

**TH 432 Introduction to Stage Design: Costume (3)**

Adapting historic and contemporary fashion for the stage, film and television. Script and character analysis for costume design and detail. Contemporary professional practices. 1 seminar, 2 laboratories. Prerequisite: TH 330 or consent of instructor.

**TH 434 Introduction to Stage Design: Lighting and Sound (3)**

Lighting and sound design for the stage, dance concert and exhibitions. From script analysis, exhibition proposal, costume or scenic renderings through the rendering of production lighting and sound plots. Light and color. Contemporary instrumentation and controls. Production analysis. Practical execution in performance situations. 1 seminar, 6 hours of laboratory by arrangement. Prerequisite: TH 330 or consent of instructor.

**TH 450 Theatre Management (3)**

Organization and operation of the regional, community or educational theatre company from staffing, program selection, publicity, house and box office operation, budgeting and contracts, art center participation. 1 lecture, 2 activities. Prerequisite: Consent of instructor.

**TH 470 Selected Advanced Topics (1-3)**

Directed group study of selected topics for advanced students. Open to undergraduate and graduate students. Class schedule will list topic selected. Total credit limited to 6 units. 1 to 3 lectures. Prerequisite: Consent of instructor.

**VGSC—VEGETABLE SCIENCE****VGSC 230 General Vegetable Crops (4)****GEB F.2.**

Principles involved in production, harvesting, packaging, and marketing of major California vegetable crops. Survey of the vegetable industry for other than crop science majors. Credit not allowed for both VGSC 230 and VGSC 232. Miscellaneous course fee required—see *Class Schedule*. 3 lectures, 1 laboratory.

**VGSC 232 Vegetable Crops Production (4)**

Production, adaptation, utilization of vegetable crops such as cole crops, beans, celery, peppers, squash, melons, cucumbers, lettuce, carrots, spinach, sweet potatoes. Field trip to a major California vegetable production area required. Credit not allowed for both VGSC 230 and VGSC 232. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: CRSC 133.

**VGSC 250 Home Vegetable Production (2)**

Practical aspects of growing vegetable crops in the home garden. Seedbed preparation, mulching, composting, transplanting, seeding, irrigation, fertilization and cultural practices utilized in production of vegetable crops. 1 lecture, 1 laboratory.

**VGSC 324 Harvesting and Packaging Vegetable Crops (4)**

Harvesting methods and procedures; current handling and packaging techniques; containers; pre-cooling and refrigerated storage; post harvest physiology of fresh market vegetables. Field trip to a major California vegetable production area required plus local grower visits. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: VGSC 232 or consent of instructor.

**VGSC 326 Advanced Vegetable Production (4)**

Advanced studies of recent developments and problems of vegetable production. Cultural practices associated with mechanization. Field trip to a major California vegetable production area required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: VGSC 232.

**VGSC 424 Vegetable Crop Management (4)**

Organization, management, and operation of commercial vegetable production considering the varied aspects of the entire commercial vegetable industry. Field trip to a major California vegetable production area required. Miscellaneous course fee may be required—see *Class Schedule*. 3 lectures, 1 laboratory. Prerequisite: VGSC 326 or consent of instructor.

**VGSC 521 Advanced Vegetable Science (4)**

Advanced study of vegetable science. Special study projects. 3 lectures, 1 laboratory. Prerequisite: Graduate standing and consent of instructor.



## VS—VETERINARY SCIENCE

### VS 109 Principles of Veterinary Science (5)

Structural aspects and functions of the principal systems of farm animals, control and prevention of common diseases causing economic losses in livestock. 4 lectures, 1 laboratory. To be taken by technical students only, in substitution for VS 123, 302 and 203. Not open to degree students for degree credit. Prerequisite: BIO 101.

### VS 123 Anatomy and Physiology (3)

Structural aspects and the normal functions of the principal systems of the various farm animals. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

### VS 200 Special Problems for Undergraduates (1–2)

Individual investigation, research, studies or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### VS 203 Animal Parasitology (3)

Identification, life cycles, prevention and control of the common external and internal parasites causing economic loss in livestock. 3 lectures. Prerequisite: ZOO 131.

### VS 241 Veterinary Technology (2)

Application of paraprofessional knowledge and skills including medical terminology, pharmacological metrology, and animal identification, behavior, and restraint. 2 activities.

### VS 302 Animal Hygiene (3)

Basic disease concepts, transmission of infectious diseases, fundamentals of immunology. Infectious disease preventive principles. Livestock producer's role and responsibilities in governmental farm animal disease control programs. 3 lectures. Prerequisite: BACT 221.

### VS 310 Zoonosis (2)

Significant public health diseases transmissible to man through domestic and wild animals, vectors, and food resources. 2 lectures. Prerequisite: ZOO 131 or BIO 101.

### VS 341 Veterinary Technology—Advanced (2)

Application of advanced paraprofessional knowledge involving principles of asepsis, anesthesia, veterinary instrumentation and radiology. Supportive techniques in anesthesia, surgical preparation, and veterinary hematology. 2 activities. Prerequisite: VS 241.

### VS 400 Special Problems for Advanced Undergraduates (1–2)

Individual investigation, research, studies, or surveys of selected problems. Total credit limited to 4 units, with a maximum of 2 units per quarter. Prerequisite: Consent of department head.

### VS 438 Systemic Animal Physiology (4)

Homeostatic relationships of organ systems. Cardiovascular, respiratory, urogenital and neuro-endocrinological functions. 3 lectures, 1 laboratory. Prerequisite: VS 123, CHEM 328.

## ZOO—ZOOLOGY

### ZOO 131 General Zoology (4)

GEB B.1.b.

Cells, tissues, and organ systems of vertebrates; emphasis on man and domestic animals. 2 lectures, 2 laboratories.

### ZOO 132 General Zoology (4)

GEB B.1.b.

Embryology, genetics, taxonomy, economic zoology, ecology and evolution. 2 lectures, 2 laboratories. Prerequisite: ZOO 131.

### ZOO 133 General Zoology (4)

Variety, structure and distribution of invertebrate animals. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 237 Human Anatomy (3)**

Structure of the human body as the basis of function. Supplemented with demonstrations of human cadavers. Not open for Anatomy and Physiology Concentration credit to students who have completed ZOO 326. 2 lectures, 1 laboratory. Prerequisite: ZOO 131.

**ZOO 300 Human Physiology (5)**

Function of various organ systems of man with laboratory experiments. Not open for Anatomy and Physiology concentration credit to students who have completed ZOO 432 or ZOO 433. 4 lectures, 1 laboratory. Prerequisite: ZOO 131 and general chemistry.

**ZOO 303 Vertebrate Embryology (3)****GEB B.1.b.**

Developmental processes from the egg to the formation of the body and the establishment of the principal organs and systems. 3 lectures. Prerequisite: ZOO 132.

**ZOO 304 Vertebrate Embryology Laboratory (2)**

Developmental anatomy of selected stages of the frog, chicken and pig. Demonstrations and exercises in the preparation of embryonic materials for study purposes. 2 laboratories. Prerequisite: ZOO 303 (may be taken concurrently).

**ZOO 321 Mammalogy (4)****GEB B.1.b.**

Identification, biology and economic importance of mammals, with special reference to California species. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 322 Ichthyology (4)****GEB B.1.b.**

Identification, physiology, anatomy, and behavior of marine and freshwater fishes with special reference to local and economically important species. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 323 Ornithology (4)****GEB B.1.b.**

Classification, anatomy and physiology, ecology and behavior, and economic importance of birds. Four Saturday field trips required. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 324 Zoo Biology (3)**

Wild animals in captivity; principles and problems of maintaining them for recreational, educational and scientific purposes. 3 lectures. Prerequisite: One course in biology or zoology.

**ZOO 326 Comparative Anatomy of the Vertebrates (5)****GEB B.1.b.**

Comparative structure of vertebrate organ systems. 3 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 329 Vertebrate Field Zoology (4)****GEB B.1.b.**

Identification and natural history of terrestrial vertebrates, with emphasis on field studies and local species. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 336 Invertebrate Zoology (4)**

Invertebrate groups of animals with emphasis on taxonomy, morphology, distribution and economic importance. 2 lectures, 2 laboratories, and field work. Prerequisite: ZOO 133.

**ZOO 340 Human Muscle Anatomy (2)**

Muscles of a human cadaver. 1 lecture, 1 laboratory. Prerequisite: ZOO 237 (may be taken concurrently).

**ZOO 341 Herpetology (4)****GEB B.1.b.**

Living and extinct reptiles and amphibians; an adaptive approach to their diversity, biology, and classification. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 356 Neurobiology (3)****GEB B.1.b.**

Survey of the nervous system with emphasis on functional anatomy of the human brain. Motor and sensory systems. Neural control mechanisms, including neurotransmitters and neuromodulators. Development, aging, and common disorders. 3 lectures. Prerequisite: ZOO 131.

**ZOO 412 Introduction to Clinical Pathology (3)**

Malignant, deficiency, degenerative and other noninfectious diseases from the standpoint of etiology, manifestations and laboratory findings. 3 lectures. Prerequisite: CHEM 328, ZOO 239 or BIO 431.

**ZOO 422 Histology (4)**

Functional microscopic anatomy of principal tissues and organs of vertebrates. 2 lectures, 2 laboratories. Prerequisite: ZOO 132.

**ZOO 425 Parasitology (4)**

External and internal parasites of man and animals; life history; parasite-host relationships; control and recognition of species of clinical importance. 2 lectures, 2 laboratories. Prerequisite: ZOO 132. Recommended: ZOO 133.

**ZOO 426 Serology and Immunology (4)**

Nature of innate and acquired immune reactions; theory and techniques of serological methods in diagnosing disease. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: Consent of instructor.

**ZOO 428 Hematology (4)**

Formation, composition, function and destruction of blood in health and disease. Methods for examination of blood. Designed for preparing laboratory technologists. 2 lectures, 2 laboratories. Prerequisite: ZOO 131 and consent of instructor. Recommended: ZOO 426.

**ZOO 432 Physiology II: Comparative Systems (4)**

Physiological mechanisms involved in osmotic and ionic regulations, digestion, circulation, respiratory energetics and thermal acclimation. Laboratory experiments in physiological processes and their ecological importance. 2 lectures, 2 laboratories. Prerequisite: BIO 431.

**ZOO 433 Physiology III: Endocrine and Reproductive (4)**

Introduction to the endocrine and reproductive systems of vertebrate animals. Includes not only classical actions of hormones but also mechanisms of hormone action, relationship between nervous and endocrine systems, hormone bioassay, and selected clinical aspects of endocrinology. 3 lectures, 1 laboratory. Prerequisite: ZOO 132 and BIO 431.

**ZOO 437 Animal Behavior (4)**

Behavioral adaptations of animals to their environment and way of life. Analysis of behavior patterns, use of patterns in clarifying evolutionary and ecological relationships. 3 lectures, 1 laboratory. Prerequisite: ZOO 132. Recommended: BIO 315, BIO 325.

**ZOO 524 Functional Vertebrate Morphology (3)**

Analysis of locomotor and feeding mechanisms. 2 seminars, 1 laboratory. Prerequisite: Graduate standing.

**ZOO 530 Behavioral Ecology (3)**

Function and evolution of behavioral phenomena as they relate to ecological phenomena. Topics include: habitat selection; spacing mechanisms; reproductive strategies; feeding strategies; agonistic, parasitic, and altruistic behavior; migration; and comparative social systems. 3 seminars. Prerequisite: Graduate standing, BIO 325 or BOT 326, ZOO 437. Recommended: BIO 315, PSY 304.



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# Directories

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# UNIVERSITY ADMINISTRATION

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## OFFICE OF THE PRESIDENT

President .....	Warren J. Baker
Administrative Assistant .....	Grace Arvidson
Associate Executive Vice President .....	Howard West
Affirmative Action Coordinator .....	Smiley E. Wilkins
Director, Institutional Studies .....	Malcolm W. Wilson

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Director of Operations .....	Frank T. Lebens
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Academic Program Planner .....	
Associate Provost for Enrollment Support Services .....	Roger M. Swanson
Admissions Officer .....	David H. Snyder
Associate Dean, Educational Services .....	Donald M. Coats
Coordinator, Relations with Schools .....	Leonard A. Gonzales
Manager, Student Data Systems Office .....	Thomas L. Zuur
Registrar .....	Gerald N. Panches
Supervisor, Evaluations .....	Paula Ringer
Coordinator, Writing Skills Program .....	John F. Harrington
Director, Cooperative Education .....	Fred Abitia
Director, Extended Education .....	Howard M. Vollmer
Director, Research Development .....	Robert A. Lucas
Assistant Director .....	Margaret Cardoza

## Schools and Departments

SCHOOL OF AGRICULTURE .....	Dean, Lark P. Carter
	Associate Dean, Larry P. Rathbun
	Associate Dean, John W. West
Agricultural Education .....	Joseph E. Sabol
Agricultural Engineering .....	Edgar J. Carnegie
Agricultural Management .....	M. LeRoy Davis
Animal Sciences and Industry .....	John W. Algeo
Crop Science .....	Corwin M. Johnson
Dairy Science .....	Eugene E. Starkey
Food Science and Nutrition .....	Robert D. Vance
Natural Resources Management .....	Norman H. Pillsbury (Interim)
Ornamental Horticulture .....	Ronald D. Regan
Soil Science .....	Brent G. Hallock

SCHOOL OF ARCHITECTURE AND ENVIRONMENTAL DESIGN .....	Dean, Gar Day Ding
	Associate Dean, K. Richard Zweifel

Architctural Engineering .....	David S. Hatcher
Architecture .....	W. Mike Martin
City and Regional Planning .....	William A. Howard
Construction Management .....	David R. Pierce, Jr.
Landscape Architecture .....	Gerald L. Smith

<b>SCHOOL OF BUSINESS</b> .....	Dean, Kenneth D. Walters
Accounting .....	Associate Dean, M. Zafar Iqbal
Business Administration .....	William C. Boynton
Economics .....	Dan Bertozzi, Jr.
Management .....	Panagiotis Papakyriazis
	Robert H. McIntire

<b>SCHOOL OF ENGINEERING</b> .....	Dean, Duane F. Bruley
	Associate Dean, Peter Y. Lee
Aeronautical Engineering .....	E. Roberts Wood
Civil Engineering and Environmental Engineering .....	Stephen Hockaday (Interim)
Computer Science .....	Neil W. Webre (Interim)
Electronic and Electrical Engineering .....	James G. Harris
Engineering Technology .....	William R. Backer
Industrial Engineering .....	Donald E. Morgan
Mechanical Engineering .....	Position Vacant
Metallurgical Engineering .....	George T. Murray

<b>SCHOOL OF LIBERAL ARTS</b> .....	Dean, Jon M. Ericson
	Associate Dean, Bessie R. Swanson
Art and Design .....	Robert G. Reynolds (Interim)
English .....	Mona G. Rosenman
Foreign Languages .....	William T. Little
History .....	Max Riedlsperger
Journalism .....	Randall L. Murray
Music .....	Clifton E. Swanson
Philosophy .....	Talmage E. Scriven (Interim)
Political Science .....	John H. Culver
Social Sciences .....	James W. Coleman
Speech Communication .....	Harry W. Sharp, Jr.
Theatre and Dance .....	Roger L. Kenvin

<b>SCHOOL OF PROFESSIONAL STUDIES AND EDUCATION</b> .....	Dean, Harry J. Busselen, Jr.
	Associate Dean, Dennis M. Nulman
Education .....	Richard L. Warren
Ethnic Studies, Coordinator .....	David J. Sanchez
Graphic Communication .....	Harvey R. Levenson
Home Economics .....	Barbara P. Weber
Industrial Technology .....	Laurence F. Talbott
Liberal Studies, Coordinator .....	Margaret J. Glaser
Military Science .....	Lt. Col. Carl L. Collins
Physical Education and Recreation Administration .....	Dwayne G. Head
Psychology and Human Development .....	Basil A. Fiorito

<b>SCHOOL OF SCIENCE AND MATHEMATICS</b> .....	Dean, Philip S. Bailey
	Associate Dean, Harry L. Fierstine
Biological Sciences .....	V. L. Holland
Chemistry .....	William C. Rife
Mathematics .....	Paul F. Murphy (Interim)
Physics .....	Leonard W. Wall
Statistics .....	James C. Daly (Interim)

## BUSINESS AFFAIRS

Vice President, Business Affairs .....	James R. Landreth
Associate Director, Business Affairs .....	Position Vacant
Budget Officer .....	Richard H. Ramirez
Director, Public Safety .....	Richard C. Brug
Financial Manager .....	Anthony B. Flores
Housing Manager .....	Joseph C. Risser
Procurement and Support Services Officer .....	Ray Macias

## FACILITIES ADMINISTRATION

Executive Dean .....	E. Douglas Gerard
Director, Plant Operations .....	Edward M. Naretto

## INFORMATION SYSTEMS

Associate Provost for Information Systems .....	David B. Walch (Interim)
Director, Audiovisual Services .....	John Heinz
Director, Computer Aided Productivity Center .....	Mark A. Cooper
Director, University Library .....	Charles R. Beymer (Interim)
Assistant Director .....	Position Vacant
Assistant Director .....	Angelina Martinez
Assistant to Director .....	Lynne E. Gamble
Manager, Computer Services .....	Joseph Grimes (Interim)
Manager, Microcomputers and Telecommunication Systems .....	Ralph Nicovich
Manager, Resource Management .....	David J. Yang

## INTERCOLLEGIATE ATHLETICS

Director .....	Kendrick W. Walker (Interim)
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## PERSONNEL AND EMPLOYEE RELATIONS

Director .....	Janet L. Pieper
Associate Director .....	Michael H. Suess
Staff Personnel Officer .....	Robert M. Negranti
Benefits and Compensation Manager .....	Barbara Melvin
Employment Manager .....	Mary Smith

## STUDENT AFFAIRS

Dean of Students .....	Russell H. Brown
Associate Dean, Student Affairs .....	Lorraine H. Howard
Associate Dean, Student Affairs .....	W. Carl Wallace
Assistant Dean, Student Affairs .....	Barbara Andre
Director, Activities Planning .....	Kenneth B. Barclay
Coordinator, Greek Affairs .....	Walter M. Lambert
Coordinator, Recreational Sports .....	Marci Snodgrass
Director, Counseling and Testing .....	Kerry T. Yamada
Coordinator, Learning Assistance Center .....	Patricia A. Stewart
Director, Student Academic Services and Educational Equity Officer....	Armando A. Pezo-Silva
Coordinator, Disabled Student Services .....	Harriet Clendenen
Director, Minority Engineering Program .....	David Cantu
Director, Upward Bound .....	Richard Morales
Director, Financial Aid .....	Lawrence J. Wolf
Director, Health Services .....	James H. Nash, M.D.
Director, Housing .....	Robert M. Bostrom
Director, Placement Center .....	Richard M. Equinoa

## UNIVERSITY RELATIONS

Vice President for University Relations .....	James L. Strom
Associate Vice President, University Relations .....	Larry R. Voss
Associate Director, University Relations .....	Darlene Slack
Director, Development .....	Position Vacant
Annual Giving Officer .....	Stan Halpern
Director, Public Affairs .....	Stan Bernstein
Public Affairs Officer .....	Donald L. McCaleb
Public Affairs Officer .....	C. Robert Anderson
Director, Alumni Relations .....	Steven B. Shockley
Assistant Director .....	B. Robert Timone



AUXILIARY ORGANIZATIONS

Associated Students, Inc.

Director, A.S.I. Business Affairs ..... Roger Conway

Foundation

Executive Director ..... Alfred W. Amaral  
Assistant to the Director ..... Robert E. Griffin  
Controller ..... James A. Neal  
Director, Communications/Media Productions ..... Eduardo A. Apodaca  
Director, Food Service ..... Everette E. Dorrough  
Manager, Accounting ..... Donna Fritz  
Manager, Data Processing ..... Neal Feaver  
Manager, El Corral Bookstore ..... C. Court Warren  
Personnel Officer ..... Barry Welchel  
Sponsored Programs Administrator ..... Thomas C. Davis

## CAL POLY CHIEF EXECUTIVE OFFICERS

Cal Poly has been guided by the following chief executive officers:

Leroy Anderson .....	1902 to 1908
Leroy Burns Smith .....	1908 to 1914
Robert W. Ryder .....	1914 to 1921
Nicholas Ricciardi .....	1921 to 1924
Margaret Chase (acting) .....	1924
Benjamin Ray Crandall .....	1924 to 1933
Julian A. McPhee .....	1933 to 1966
Dale W. Andrews (acting) .....	1966 to 1967
Robert E. Kennedy .....	1967 to 1979
Dale W. Andrews (acting) .....	1979
Warren J. Baker .....	1979 to present

## FACULTY EMERITI

*(Dates indicate period of service)*

Robert E. Kennedy (1940–1979) .....	President Emeritus
Robert W. Adamson (1953–1983) .....	Aeronautical and Mechanical Engineering
John K. Allen (1952–1970) .....	Veterinary Science
Anthony J. Amato (1955–1982) .....	Ornamental Horticulture
Elizabeth B. Anderson (1958–1980) .....	English
Olive M. Andersen (1957–1972) .....	Mathematics
Richard A. Anderson (1947–1983) .....	Physical Education
Roy E. Anderson (1949–1978) .....	Business
Warren R. Anderson (1946–1979) .....	Electronic and Electrical Engineering
Robert L. Andreini (1954–1983) .....	Speech Communication
Dale W. Andrews (1950–1983) .....	Executive Vice President
John H. Applegarth (1952–1972) .....	Biological Sciences
William W. Armentrout (1953–1980) .....	Education
James H. Babb (1959–1982) .....	Graphic Communications
Roger S. Bailey (1962–1979) .....	Art
Stanley L. Barr (1959–1980) .....	English
George C. Beatie (1959–1980) .....	Music
Lyman L. Bennion (1938–1967) .....	Animal Husbandry
Joy G. Berghell (1956–1975) .....	Library
Ellard W. Betz (1947–1976) .....	Engineering Technology
Ralph O. Bille (1948–1965) .....	Agricultural Engineering
Chester O. Bishop (1957–1973) .....	Mechanical Engineering
Emmett A. Bloom (1946–1974) .....	Animal Science
Enrico P. Bongio (1948–1979) .....	Engineering Technology
Woodford E. Bowls (1937–1973) .....	Physics
William M. Boyce (1962–1978) .....	Management
Gene E. Brendlin (1950–1971) .....	Farm Management and Cal Poly Foundation
J. Philip Bromley (1947–1973) .....	Agricultural Management
Howard C. Brown (1943–1983) .....	Ornamental Horticulture
Marvin D. Brown (1956–1963 and 1964–1976) .....	English
William L. Bruckert (1969–1984) .....	Industrial Technology
Athol J. D. Brunk (1957–1980) .....	Physics
L. LaVerne Bucy (1955–1978) .....	Animal Science
H. H. Burlingham (1948–1972) .....	Agricultural Education
William O. Buschman (1956–1980) .....	Computer Science and Statistics
Arthur G. Butzbach (1950–1970) .....	Education

Tracey G. Call (1962–1980)	Biological Sciences
Laurence H. Carr (1963–1980)	Engineering Technology
James H. Carrington (1943–1967)	Agricultural Engineering
Logan S. Carter (1947–1970)	Soil Science
Marjorie Cass (1957–1974)	Education
Everett M. Chandler (1951–1977)	Student Affairs
Daniel C. Chase (1954–1979)	Agricultural Management
Robert L. Cleath (1965 and 1968–1980)	Speech Communication
Ralph C. Collins (1955–1974)	Education
Spelman B. Collins (1940–1968)	Animal Husbandry
David W. Cook (1941–1977)	Mathematics and Academic Affairs
Frank G. Coyes (1965–1983)	Agricultural Engineering
Franklin S. Crane (1958–1985)	Mechanical Engineering
A. Norman Cruikshanks (1947–1971)	Social Sciences
James T. Culbertson (1953–1977)	Philosophy
Carl C. Cummins (1958–1983)	Dean of Communicative Arts and Humanities
Charles P. Davis (1958–1983)	Civil and Environmental Engineering
Arnold M. Dean (1949–1982)	Soil Science
Bruce A. Dickson (1952–1978)	Soil Science
Ralph W. Dilts (1944–1973)	History
John E. Dunn, Sr. (1961–1981)	Agricultural Engineering
Wesley T. Dunn (1959–1974)	Graphic Communications
Walter E. Elliott (1965–1983)	Physics
Charles A. Elston (1947–1973)	Mathematics
Edward J. Ernatt (1958–1983)	Education
Oswald J. Falkenstern (1953–1977)	Mathematics
Warren S. Farrell (1967–1981)	Agricultural Management
Harry C. Finch (1962–1980)	Biological Sciences
Millard J. Fotter (1954–1976)	Industrial Engineering
Anne C. Fowler (1965–1982)	Social Science
Clara B. Froggatt (1964–1980)	Counseling and Testing
Robert H. Frost (1953–1983)	Physics
George S. Furimsky (1955–1973)	Engineering Technology
Vincent J. Gates (1958–1977)	Journalism
Curtis F. Gerald (1964–1980)	Computer Science and Statistics
J. Corder Gibson (1949–1976)	Agricultural Education and Dean of Agriculture and Natural Resources
Marcus Gold (1947–1952 and 1954–1980)	Audiovisual
James R. Golden (1967–1983)	Industrial Engineering
David M. Grant (1950–1980)	English and Academic Affairs
Rufus L. Graves, Jr. (1951–1954 and 1957–1982)	Architecture
Thodore G. Graves (1947–1984)	Engineering Technology
C. Herold Gregory (1950–1970)	Printing Technology and Management
Lester W. Gustafson (1947–1971)	Aeronautical Engineering
Richard E. Hall (1946–1977)	Engineering Technology
Charles J. Hanks (1954–1983)	Mathematics
Reino Hannula (1962–1981)	Computer Science and Statistics
John R. Healey (1947–1980)	Journalism
Anatol Helman (1957–1974)	Architecture
Frank J. Hendel (1967–1984)	Aeronautical Engineering
Harold J. Hendriks (1952–1978)	Electronic and Electrical Engineering
Charles A. Herald (1958–1975)	Electronic and Electrical Engineering
Earl R. Hesch (1956–1983)	Engineering Technology
William R. Hicks (1957–1983)	Physical Education
George E. Hoffman (1956–1979)	Industrial Engineering
Wilbur C. Hogan (1959–1973)	Philosophy
Ray J. Holt (1955–1978)	Physics

Walter E. Holtz (1954–1966 and 1968–1982)	Environmental Engineering
Gilbert L. Homfeld (1960–1976)	Mathematics
H. Clyde Hostetter (1958–1983)	Journalism
A. L. Houk (1946–1972)	Chemistry
Ernest R. Houston (1957–1983)	Ornamental Horticulture
LeRoy B. Hughes (1950–1971)	Physical Education
Edgar A. Hyer (1951–1981)	Agricultural Management
James J. Jensen (1948–1973)	Physical Education
Mead R. Johnson (1956–1980)	English
Miles B. Johnson (1957–1983)	English
Robert M. Johnston (1946–1954 and 1956–1974)	Engineering Technology
Thomas V. Johnston (1967–1985)	Art and Associate Dean of Communicative Arts and Humanities
Edward J. Jorgensen (1947–1976)	Physical Education
William B. Judd (1956–1981)	Mathematics
Herbert R. Kabat (1952–1983)	Physics
John J. Kane (1969–1984)	Aeronautical and Mechanical Engineering
Roger A. Keech (1965–1983)	Aeronautical and Mechanical Engineering
Helen P. Kelley (1966–1985)	Art
Paul Kenyon (1957–1982)	Business Administration
Richard T. Kombrink (1956–1980)	Engineering Technology
Russell Korsmeyer (1958–1978)	Electronic and Electrical Engineering
William E. Krupp (1965–1980)	Engineering Technology
Alexander N. Landyshev (1956–1972)	Electronic and Electrical Engineering
James A. Langford (1955–1976)	Education
Paul S. Lansman (1964–1979)	Mathematics
John D. Lawson (1951–1978)	Activities Planning
Richard I. Leach (1930–1971)	Poultry Industry
Vance D. Lewis (1946–1972)	Physics and School of Science and Mathematics
Charles H. Lindamood (1958–1979)	English
Willard H. Loper (1955–1983)	Agricultural Engineering
Bernice B. Loughran (1958–1980)	Art
Thomas M. Lukes (1962–1985)	Food Science
Leon W. Magur (1958–1983)	Physics
Ena L. Marston (1946–1970)	English
Scott J. Maughan (1965–1980)	History
James M. McGrath (1946–1975)	Engineering Technology
George H. McMeen (1960–1977)	Mathematics
Mac McRobbie (1962–1979)	Industrial Technology
John L. Merriam (1958–1978)	Agricultural Engineering
Thomas O. Meyer (1955–1979)	Food Science
Allen D. Miller (1960–1983)	Mathematics
David H. Montgomery (1956–1985)	Biological Sciences
John H. Mott (1967–1983)	English
Robert A. Mott (1946–1978)	Physical Education
Billy W. Mounts (1956–1977)	Health Center Physician and Surgeon
Loren L. Nicholson (1956–1979)	Journalism
Dell O. Nickell (1964–1980)	Architectural Engineering
Glenn A. Noble (1947–1973)	Biological Sciences
Thomas F. Nolan (1949–1974)	Political Science
Howard R. O'Daniels (1938–1971)	Business Administration
Michael J. O'Leary (1951–1982)	Social Science
Leon F. Osteyee (1957–1983)	Aeronautical and Mechanical Engineering
Philip H. Overmeyer (1958–1972)	Business Administration
Gordon J. Paul (1969–1983)	Accounting
Evelyn I. Pellaton (1966–1982)	Physical Education
James M. Peters (1958–1980)	Chemistry

James J. Peterson (1964–1984)	English
William J. Phaklides (1963–1984)	Engineering Technology
Richard A. Pimentel (1952–1983)	Biological Sciences
Clifford J. Price (1956–1974)	Aeronautical Engineering
John B. Rapp (1959–1979)	Mechanical Engineering
Evelyn D. Reagan (1946–1948 and 1954–1977)	Library
Oscar E. Reece (1956–1973)	Crop Science
R. Howell Reece (1946–1964)	Mechanical Engineering
R. Wallace Reynolds (1953–1979)	Engineering Technology
Howard Rhoads (1956–1983)	Crop Science
Glenn W. Rich (1953–1979)	Agricultural Engineering
Carlos C. Richards (1946–1971)	Engineering Technology
Torleif M. Rickansrud (1944–1969)	Physics
Rol W. Rider (1960–1982)	Business Administration
Eugene A. Rittenhouse (1949–1976)	Economics and Placement
Leo E. Rogers (1954–1978)	Engineering Technology
Robert L. Rosenberg (1970–1985)	History
Leo E. Sankoff (1942 and 1946–1980)	Agricultural Education
Harry H. Scales (1958–1976)	Education
Paul E. Scheffer (1964–1983)	Industrial Engineering
Walter P. Schroeder (1957–1980)	Education
Glenn E. Seeber (1954–1979)	Engineering Technology
Owen L. Servatius (1947–1983)	Management
Vard M. Shepard (1932–1960)	Animal Husbandry and Dean of Agriculture
Orien W. Simmons (1961–1980)	Metallurgical and Welding Engineering
Howard F. Smith (1968–1983)	Economics
J. Murray Smith (1960–1981)	Speech Communication
M. Eugene Smith (1946–1974)	History
Warren T. Smith (1952–1973)	Dean of Agriculture
L. Robert Sorensen (1966–1983)	Psychology
Ruth G. Spencer (1967–1982)	Library
Fred H. Steuck (1947–1978)	Electronic and Electrical Engineering
Ellen T. Stookey (1961–1978)	Home Economics
J. Edward Strasser (1960–1984)	Industrial Technology
L. Harry Strauss (1961–1976)	Library
John S. Stuart (1964–1983)	Architecture
David H. Thomson (1946–1979)	Biological Sciences
Frank P. Thrasher (1963–1980)	Crop Science
Harmon B. Toone (1952–1977)	Dairy and Poultry Science
Dean Trembly (1961–1976)	Counseling and Testing
William R. Troutner (1942–1976)	Crop Science
Pearl Turner (1951–1974)	Library
Robert G. Valpey (1972–1983)	Dean of Engineering and Technology
Herman C. Voeltz (1965–1983)	History
Ralph M. Vorhies (1946–1980)	Crop Science
Evelyn K. Voros (1955–1974)	Speech
Isaac N. Walker (1967–1983)	English
Wesley W. Ward (1954–1983)	Architecture
Omer K. Whipple (1956–1976)	Chemistry
Mary Lou White (1961–1979)	Physical Education
Francis F. Whiting (1946–1970)	Engineering Technology
Milo E. Whitson (1947–1974)	Mathematics
J. Barron Wiley (1956–1978)	Education
Richard C. Wiley (1946–1983)	Metallurgical and Welding Engineering
Maurice L. Wilks (1966–1983)	Architecture
Irwin A. Willson (1958–1975)	Education
Harold O. Wilson (1936 and 1946–1974)	Administrative Vice President

C. Paul Winner (1940–1971)	Agricultural Mechanics
Arthur D. Wirshup (1952–1977)	Mathematics
Victor F. Wolcott (1962–1983)	Business Administration
John A. Woodworth (1949–1974)	Mathematics
Lloyd J. Work (1958–1978)	Physics
Dorothy S. Wright (1946–1966)	Library

## DISTINGUISHED TEACHER AWARD RECIPIENTS

In 1963 the University instituted a program of recognizing outstanding teaching efforts through the Distinguished Teacher Awards. Selections for this honor are based upon recommendations of the Academic Senate committee which follows the procedure of soliciting nominations from students and colleagues. Evaluations and subsequent recommendations of the nominees are based upon an in-depth review by the committee, including classroom visitations. Recipients of the Distinguished Teacher Awards and their departments since the inception of the program are listed below.

1963–64	Robert E. Holmquist, Physics John L. Merriam, Agricultural Engineering
1964–65	Joy O. Richardson, Mechanical Engineering Milo E. Whitson, Mathematics
1965–66	A. Norman Cruikshanks, Social Sciences Richard F. Johnson, Animal Husbandry George R. Mach, Mathematics
1966–67	Robert W. Adamson, Mechanical Engineering Kenneth G. Fuller, Mathematics William D. Curtis, Psychology
1967–68	Rodney G. Keif, Environmental Engineering David M. Grant, English Wesley S. Ward, Architecture
1968–69	Robert M. Johnson, Mechanical Engineering Bruce Kennelly, Chemistry Alice E. Roberts, Education
1969–70	Donald W. Hensel, History David H. Montgomery, Biological Sciences Philip H. Overmeyer, Business Administration Willard M. Pederson, English Omer K. Whipple, Chemistry
1970–71	Robert L. Cleath, Speech Kenneth E. Schwartz, Architecture Hewitt G. Wight, Chemistry
1971–72	Stuart E. Larsen, Aeronautical Engineering Barton C. Olsen, History Ronald L. Ritschard, Biological Sciences Joseph N. Weatherby, Social Sciences
1972–73	Lyle G. McNeal, Animal Science Charles W. Quinlan, Architecture James E. Simmons, English
1973–74	William J. Phaklides, Engineering Technology Louis D. Pippin, Education Duane O. Seaberg, Agricultural Management
1974–75	Peter Jankay, Biological Sciences Josephine S. Stearns, Child Development George J. Suchand, Social Sciences
1975–76	James Hayes, Journalism William V. Johnson, Music Erna Knapp, Art
1976–77	Harry L. Fierstine, Biological Sciences Grant D. Venerable II, Chemistry Ralph M. Warten, Mathematics

1977-78	Timothy M. Barnes, History Donald P. Grant, Architecture and Environmental Design John C. Syer, Political Science
1978-79	Pat Pendse, Biological Sciences Dane Jones, Chemistry Adelaide Harmon-Elliott, Mathematics
1979-80	David J. Keil, Biological Sciences Thomas Ruehr, Soil Science Stephen Weinstein, Mathematics Michael D. Zohns, Ornamental Horticulture
1980-81	Sarah E. Burroughs, Child Development and Home Economics Christina Orr-Cahall, Art Kendrick W. Walker, Philosophy
1981-82	Christina A. Bailey, Chemistry Kenneth E. Ozawa, Physics Thomas L. Richards, Biological Sciences
1982-83	James Bermann, Agricultural Engineering Donald J. Koberg, Architecture Jack D. Wilson, Aeronautical and Mechanical Engineering
1983-84	Euel W. Kennedy, Mathematics William L. Preston, Social Sciences Michael J. Wenzl, English
1984-85	Robert S. Cichowski, Mathematics Harvey C. Greenwald, Mathematics Max E. Riedlsperger, History

## STAFF EMERITI

*(Dates indicate period of service)*

Vic Allen (1951-1976)	Custodial Services
Fern Ballard (1954-1974)	Foundation
Joe C. Baze (1962-1980)	Plant Operations
Gertrude E. Beck (1968-1983)	Activities Planning
James P. Becker (1962-1980)	Plant Operations
Alva F. Bingham (1961-1985)	Food Services
Dorothy M. Bishop (1962-1980)	Education
Doris Bodine (1961-1978)	Food Services
Leona M. Boerman (1944-1967)	President's Office
Harold A. Burnett (1962-1977)	Agriculture and Natural Resources
William K. Butts (1965-1980)	Plant Operations
Cyrus E. Casady (1950-1974)	Plant Operations
Orlan Casey (1957-1983)	Plant Operations
George W. Cockriel (1957-1977)	University Police
Loretta I. Costen (1953-1976)	Engineering and Technology
Bernard R. Cox (1968-1983)	Aeronautical and Mechanical Engineering
Richard T. Crosby (1949-1971)	Grounds
Donald J. Curtis (1960-1976)	Health Center
Roy E. Darr (1953-1971)	Plant Operations
Elizabeth D. Dickens (1961-1980)	Architecture and Environmental Design
Lloyd G. Dietrich (1953-1973)	University Police
Paul S. Dillon (1947-1971)	Foundation
Colier Duncan (1955-1977)	Plant Operations
John Dyer (1963-1979)	Plant Operations
Merriam J. Erickson (1962-1980)	Plant Operations
Wilbur T. Erpenbach (1967-1982)	Electronic and Electrical Engineering
Lloyd R. Evans (1959-1978)	Grounds

Mary Eyler (1961–1980)	Financial Aid
Patricia A. Eilers Farrow (1957–1972)	Health Center
Leroy Fauset (1966–1983)	El Corral Bookstore
James Fiscalini (1966–1982)	Farm Shop
Bernard J. Fitzgerald (1958–1980)	Mail Room
Juanita A. Fredericks (1954–1974)	El Corral Bookstore
Jack Fryer (1968–1984)	Foundation Personnel
Helen K. Garing (1966–1983)	Crop Science
Lena Gianolini (1949–1972)	Business Affairs
Gertrude Gladin (1957–1972)	Housing
Ruth Gran (1957–1975)	Health Center
Josephine R. Graves (1964–1982)	Health Center
Margaret Green (1960–1977)	Food Services
Mary Lee Green (1948–1976)	El Corral Bookstore
Joseph C. Hampl (1943–1971)	Foundation
Francine Haggood (1951–1976)	Business Affairs
Dora L. Harter (1968–1983)	Learning Assistance Center
Florence I. Hauge (1962–1983)	Library
Walter Heffner (1965–1983)	Computer Center
Norma Henderson (1949–1983)	Academic Affairs
C. Milton Hill (1966–1983)	Transportation Services
F. Jerald Holley (1961–1983)	Admissions, Records, and Evaluations
Alicemae Hollings (1966–1982)	Foundation
Lillian R. Hooks (1964–1980)	Library
Catherine S. Hoover (1945–1946) (1962–1983)	Science and Mathematics
Irene R. Horvath (1950–1983)	Communicative Arts and Humanities
Margaret Hoyt (1948–1981)	El Corral Bookstore
Clara Huffman (1959–1974)	El Corral Bookstore
Hazel L. Hunter (1965–1980)	Evaluations
Marie Williams Janolis (1962–1977)	Engineering Technology
Elmer R. Johnson (1966–1982)	Physics
Mary L. Johnson (1950–1976)	Administrative Affairs
Tommie L. Jones (1964–1980)	Business Affairs
Connie Jonte (1961–1983)	Alumni Services
Edwin Koch (1961–1976)	Foundation Custodial
Edna J. Kuhnes (1969–1984)	Library
George Lancaster (1962–1979)	Plant Operations
Ronald J. Larsen (1968–1983)	Public Safety
Lois L. Larson (1962–1978)	Health Center
John Lee (1960–1975)	Food Services
Marianne Lefebvre (1968–1984)	Financial Operations
Ervin A. Lembcke (1962–1980)	Plant Operations
Alfons P. Lerno (1965–1983)	Plant Operations
Wayne Lindsey (1953–1983)	Farm Shop
Joe A. Lipe (1965–1980)	Plant Operations
Irene Lund (1961–1984)	Foundation
Ruth Lundquist (1960–1979)	Business Affairs
Josephine E. Maddalena (1965–1980)	Physical Education
Jerry T. Magetti Jr. (1960–1984)	Mail Center
James Mapes (1961–1977)	University Police
Anne B. Marcell (1961–1982)	Evaluations
K. Jon Mayeda (1954–1982)	Plant Operations
Daniel H. McCready, Jr. (1961–1983)	Plant Operations
Dorothy J. McDonald (1963–1985)	Telecommunications
Florence H. Mesler (1962–1983)	Health Center
Julius F. Metz (1968–1983)	Plant Operations
Lionel Middlecamp (1942–1976)	Head Farmer



Viola E. Hughes Milburn (1956–1978)	Health Center
Robert J. Miller (1960–1980)	Business Affairs
Valdora Myers (1960–1978)	Health Center
Harold A. Nash (1947–1974)	Power Plant
Margaret Nelson (1959–1977)	Housing
Avice I. Nolan (1960–1980)	Audiovisual
Edward L. Nolan (1953–1979)	Mechanical Engineering
Lee Owen (1946–1978)	Plant Operations
Kathryn Patterson (1960–1982)	Procurement and Support Services
Alfred J. Pelucca (1956–1971)	Custodial Services
Charles O. Penwell (1946–1971)	Foundation
Joseph C. Pereira (1970–1985)	Plant Operations
Joan Roberts (1958–1980)	Foundation
Al Sanders (1964–1979)	Grounds
Edmond L. Schellenger (1966–1983)	Plant Operations
Ralph Schurtz (1949–1973)	Custodial Services
Mary E. Scrivner (1966–1983)	Academic Programs
F. Yvonne Southgate (1963–1980)	Mechanical Engineering
Jean Steck (1960–1975)	Industrial Engineering
Marcie Steger (1962–1979)	Food Services
Mary Jo Summers (1962–1980)	Health Center
Frank Y. Sweeney (1963–1983)	Plant Operations
Arthur A. Thorn (1962–1979)	Business Affairs
Henry VerDoorn (1968–1983)	Plant Operations
Merlin Ward (1946–1974)	Plant Operations
Boyd Wettlaufer (1960–1976)	Audiovisual
Gerald Whiteford (1960–1983)	El Corral Bookstore
Alfred T. Wilcox (1960–1975)	Custodial Services
Margaret Wilmot (1952–1979)	Library
Frank H. Wyman (1956–1972)	Plant Operations
Arthur J. Young (1958–1985)	Plant Operations
Howard Zaugg (1966–1983)	Plant Operations

## FACULTY AND STAFF

(Number in parentheses indicates year of appointment)

Listed as of May, 1986

- ABITIA, FRED (1969–1973) (1975) ..... Cooperative Education  
B.A., San Jose State College, 1964; M.A., 1966; Ed.D., Washington State University, 1971. Director.
- ABSHIRE, FRANKLIN P. (1977) ..... Engineering Technology  
B.S., Arizona State University, 1969; M.S., 1974. Professor. Registered Professional Engineer, Arizona, Ohio.
- ACETO, JEANNE C. (1981) ..... Placement Center  
B.A., Whittier College, 1965; M.A., Stanford University, 1966. Student Employment Coordinator.
- ACORD, DORIS (PAT) (1980) ..... Physical Education and Recreation Administration  
B.A., Morehead State, 1961; M.A., Ball State University, 1965; M.A., Southern Illinois University, 1975; Ph.D., 1977. Associate Professor.
- ADALIAN, PAUL T., JR. (1978) ..... University Library  
B.A., Stanislaus State College, 1966; M.A., Loyola University of Los Angeles, 1968; M.L.S., Syracuse University, 1971. Associate Librarian.
- ADAMS, JOHN P., JR. (1970) ..... Economics  
M.A., Claremont Graduate School, 1968; Ph.D., 1972. Professor.
- ADAMS, STEPHEN H. (1974) ..... Associated Students, Inc.  
B.S., Southern Illinois University, Edwardsville, 1969; M.S., Kansas State University, 1973. Associate Director.
- AHERN, JAMES J. (1980) ..... Agricultural Management  
B.S., California State Polytechnic College, Pomona, 1971; M.S., University of Maryland, 1973; Ph.D., 1980. Associate Professor.
- AIKEN, JAMES L. (1976) ..... Counseling Services  
B.A., University of Florida, 1964; M.Ed., 1965; Ph.D., Missouri University, 1970. Diplomate in Counseling Psychology of American Board of Professional Psychology. Associate Director.
- ALEXANDER, WILLIAM M. (1958) ..... Political Science  
B.S., Oregon State University, 1949; M.S., 1951; M.A., Pennsylvania State University, 1953; Ph.D., University of Oregon, 1962; additional graduate study, University of Stockholm, George Washington University, University of Georgia. Professor.
- ALGEO, JOHN W. (1985) ..... Animal Sciences and Industry  
B.S., State College of Washington, 1948; M.S., 1949. Professor and Department Head. Registered Professional Animal Scientist.
- AL-HADAD, SABAH (1965) ..... Mathematics  
B.S., Texas Technological College, 1960; M.A., California State Polytechnic College, 1962; Ed.D., Arizona State University, 1972. Associate Professor.
- AMANZIO, JOSEPH C. (1971) ..... Architecture  
B.Arch., University of Florida, 1967; M.Arch., Washington University, 1974. Professor. Registered Architect, California.
- AMARAL, ALFRED W. (1967) ..... University Foundation  
B.S., California State Polytechnic College, 1964; M.B.A., Golden Gate College, 1970. Executive Director.
- AMEDEE, GASTON (1976) ..... Soil Science  
B.S., University of Haiti, 1963; M.S., University of Connecticut, 1971; Ph.D., Cornell University, 1974. Associate Professor.
- ANDERSON, C. ROBERT (1982) ..... Public Affairs  
B.A., Duke University, 1965; M.A., University of Missouri, 1973. Public Information Officer.
- ANDERSON, MARSHALL L. (1975) ..... Civil and Environmental Engineering  
B.S., University of Minnesota, 1943; M.S., 1949; Ph.D. University of Wisconsin, 1972. Professor. Registered Professional Engineer, South Dakota.
- ANDERSON, RUSSELL K. (1955) ..... Animal Sciences and Industry  
B.S., University of Minnesota, 1948; M.S., Iowa State College, 1950; Ph.D., 1956. Professor.
- ANDERSON, SARAH J. (1984) ..... Financial Aid  
B.A., University of California, Santa Barbara, 1970. Assistant Director.

- ANDERSON, YVONNE M. (1980) ..... Student Health Services  
A.B., University of Kansas, 1951; Medical Technology Internship, 1952. Clinical Laboratory Technologist. California Licensed Clinical Laboratory Technologist, American Association of Bioanalysts Supervisor Certified.
- ANDOLI, FREDERICK P. (1968) ..... Biological Sciences  
B.A., Upsala College, 1963; M.S., Utah State University, 1968; D.A., Idaho State University, 1974. Professor.
- ANDRE, BARBARA R. (1973) ..... Student Affairs  
B.A., Humboldt State University, 1969; M.A., California Polytechnic State University, 1971. Assistant Dean.
- ANDREOLI, ALFRED E. (1963) ..... Aeronautical Engineering  
B.S., University of Colorado, 1954; M.S., California Institute of Technology, 1956; additional graduate study, University of Colorado. Professor. Registered Professional Engineer, California.
- ANDRESEN, JAMES G. (1956) ..... Mechanical Engineering  
B.S., California State Polytechnic College, 1956; M.Eng., 1979. Associate Professor.
- ANDREWS, CHARLES T. (1972) ..... Accounting  
B.S., Eastern Illinois University, 1960; M.B.A., Bowling Green State University, 1963; D.B.A., Indiana University, 1968. Professor. Certified Public Accountant.
- ANGLEY, STEPHEN F. (1982) ..... Ornamental Horticulture  
B.S., Berea College, 1969; M.S., Clemson University, 1972. Assistant Professor.
- APPELBERG, HERSCHEL L. (1971) ..... Graphic Communication  
B.S., Rochester Institute of Technology, 1965; M.A., California Polytechnic State University, 1973. Professor.
- APODACA, EDUARDO A. (1973) ..... CM/P  
B.A., University of Texas at El Paso, 1963; M.S., University of Southern California, 1979. Director.
- ARMSTRONG, GENE A. (1970) ..... Animal Sciences and Industry  
B.S., California State Polytechnic College, 1972. Professor.
- ARMSTRONG, MARY BETH (1984) ..... Accounting  
B.S., University of Nevada, Reno, 1968; M.B.A., California State Polytechnic University, Pomona, 1976; Ph.D., University of Southern California, 1984. Associate Professor. Certified Public Accountant.
- ASBURY, ROBERT F., JR. (1964) ..... Architecture  
B.S., University of Kansas, 1954; M.Arch., 1961; M.Ed., University of Hawaii, 1973. Professor. Registered Architect, Kansas.
- ATLEE, CHARLES B., JR. (1969) ..... Crop Science  
B.S., Pennsylvania State University, 1950; M.S., University of California, Davis, 1962. Professor.
- ATRE, SHARAD D. (1974) ..... Architecture  
B.Arch., University of Baroda, India, 1963; B.Arch., Washington University, 1965; M.Arch., University of Colorado, 1973. Professor. Registered Architect, California and India.
- ATTALA, EMILE E. (1970) ..... Computer Science  
B.S., Cairo University, Egypt, 1958; M.S., University of California, Berkeley, 1964; Ph.D., University of California, Santa Barbara, 1974. Professor.
- ATWOOD, LINDA (1974) ..... Chemistry  
B.A., Bard College, 1968; M.A., Wesleyan University, 1973; Ph.D., 1974. Professor.
- AUSSIEKER, MELVIN W., JR. (1980) ..... Management  
B.S., University of California, Berkeley, 1968; M.B.A., 1969; Ph.D., 1974. Professor.
- AVEY, RENNY J. (1973) ..... Agricultural Management  
B.S., California State Polytechnic College, 1969; M.S., Oregon State University, 1972; Ph.D., University of Hawaii, 1974. Professor.
- AXELROTH, ELIE (1984) ..... Counseling Services  
B.A., State University of New York, Albany, 1976; M.A., University of Maryland, 1978; Psy.D., University of Denver, 1983. Counselor.
- BABOS, PARASCHOS (1972) ..... Biological Sciences  
B.S., Birmingham University, England, 1960; Ph.D., London University, England, 1962. Associate Professor.
- BACHMAN, ALFRED M. (1970) ..... Mathematics  
B.S., Western Oregon State College, 1952; M.Ed., 1960; M.S., 1964; Ph.D., University of Oregon, 1968. Associate Professor.
- BACKER, WILLIAM R. (1977) ..... Engineering Technology  
B.M.E., Rensselaer Polytechnic Institute, 1949; M.S., Massachusetts Institute of Technology, 1950. Professor and Department Head. Registered Professional Engineer, California, Massachusetts.
- BAGNALL, JAMES R. (1969) ..... Architecture  
B.A., Occidental College, 1957; M.Arch., University of California, Berkeley, 1974. Professor.
- BAILEY, CHRISTINA ANNE (1978) ..... Chemistry  
B.S., College of Saint Elizabeth, New Jersey, 1964; Ph.D., Purdue University, 1970. Associate Professor.

- BAILEY, PHILIP S. (1969) ..... School of Science and Mathematics  
B.S., University of Texas, 1964; Ph.D., Purdue University, 1969. Professor and Interim Dean.
- BAILLIE, ALLAN S. (1978) ..... Management  
B.S., Ohio University, 1954; M.B.A., University of Washington, 1960; Ph.D., 1978. Professor.
- BAKER, EDWARD H. (1968) ..... Mechanical Engineering  
B.S., Northwestern University, 1958; M.S., University of California, 1963; Ph.D., Northwestern University, 1965. Professor.
- BAKER, WARREN J. (1979) ..... President  
B.S., University of Notre Dame, 1960; M.S., 1962; Ph.D., University of New Mexico, 1966. President.
- BALDWIN, MARYLUD (1982) ..... Education  
A.B., Wilson College, 1967; M.Ed., Virginia Commonwealth University, 1973; Ph.D., University of California, Berkeley and San Francisco State University, 1983. Assistant Professor.
- BALL, R. WAYNE (1969) ..... Student Health Services  
A.B., Westminster College, Missouri, 1957; M.D., University of Missouri School of Medicine, 1961; Internship, Mercy Hospital, Des Moines; Residency, General Practice, Santa Barbara General Hospital; Board Certified Family Practice, 1974. Associate Director.
- BALL, STEPHEN W. (1983) ..... Philosophy  
B.A., Purdue University, 1972; M.A., University of Michigan, 1973; Ph.D., 1978. Assistant Professor.
- BALLEW, THOMAS J. (1975) ..... Architectural Engineering  
B.S., University of Oklahoma, 1954; M.A., Arizona State University, 1972. Professor. Registered Civil Engineer, California; Registered Architect, California.
- BALTHASER, LAWRENCE H. (1969) ..... Physics  
B.A., Rutgers University, 1960; M.A., Indiana University, 1963; Ph.D., 1969. Professor.
- BANKS, BERNARD W. (1969) ..... Mathematics  
B.A., San Diego State College, 1964; M.S., 1967; Ph.D., Oregon State University, 1975. Professor.
- BARCLAY, KENNETH B. (1979) ..... Student Life and Activities  
B.A., Bowling Green State University, 1967; M.A., University of Massachusetts, 1969; Ph.D., Kent State University, 1975. Director.
- BARNES, TIMOTHY M. (1969) ..... History  
B.A., University of New Mexico, 1965; M.A., 1966; Ph.D., 1970. Professor.
- BARTELS, JÖRG A. (1979) ..... Landscape Architecture  
Ing. (grad.), Fachhochschule, Weihenstephan, Germany, 1967; M.L.A., University of Massachusetts, 1972; Dipl. Ing., University of Munich, Germany, 1975. Associate Professor.
- BARTHELS, KATHARINE M. (1978) ..... Physical Education and Recreation Administration  
B.S., University of California, Los Angeles, 1961; M.S., University of California, Santa Barbara, 1964; Ph.D., Washington State University, 1973. Professor.
- BASOR, ESTELLE L. (1976) ..... Mathematics  
B.A., University of California, Santa Cruz, 1969; Ph.D., 1975. Professor.
- BATTERSON, RONALD E. (1971) ..... Architecture  
B.S., University of Cincinnati, 1964; M.Arch., University of Washington, 1970; graduate study, Danish Royal Academy of Arts. Professor. George C. Marshall fellowship grant. Registered Architect, Ohio.
- BAUR, LAWRENCE E., JR. (1965) ..... Accounting  
B.B.A., University of Michigan, 1954; M.B.A., 1957. Associate Professor. Certified Public Accountant.
- BAYNE, JAY S. (1973) ..... Computer Science  
B.S., University of California, Santa Barbara, 1969; M.S., 1971; Ph.D., 1977. Professor.
- BEARDSLEY, GEORGE L., JR. (1975) ..... Economics  
B.A., University of California, Berkeley, 1971; M.A., University of Pennsylvania, 1973; Ph.D., 1974. Associate Professor.
- BEASON, STEVE B. (1985) ..... Intercollegiate Athletics  
B.S., Emporia State University, 1979; M.S., 1985. Coach.
- BEECHER, LLOYD N. (1969) ..... History  
B.A., California State College, Fullerton, 1965; M.A., 1966; Ph.D., University of Georgia, 1970. Professor.
- BENNETT, DARRELL F. (1971) ..... Student Health Services  
B.S., University of Arizona, 1965. Pharmacist.
- BENSON, GAYE G. (1984) ..... Political Science  
B.S., Shimer College, 1963; M.S., University of Missouri, 1969; Ph.D., Michigan State University, 1985. Assistant Professor.
- BERG, LORRAINE M. (1983) ..... Student Health Services  
R.N., Cuesta College, 1975; N.P. Family Planning, San Jose State University, 1982. Nurse Practitioner.

- BERMANN, JAMES (1964) ..... Agricultural Engineering  
B.S., California State Polytechnic College, 1959, 1961; M.S., Michigan State University, 1971; Ed.D., Brigham Young University, 1979. Professor.
- BERNSTEIN, STAN (1980) ..... Public Affairs  
B.S., New York University, 1961; A.M., University of Missouri, 1962. Director.
- BERTOZZI, DAN, JR. (1974) ..... Business Administration  
A.B., University of California, Berkeley, 1966; M.B.A., 1969; J.D., 1971. Professor and Department Head.
- BETHEL, A. C. W. (1968) ..... Philosophy  
B.S., University of California, Santa Barbara, 1964; M.A., 1968; Ph.D., 1974. Professor.
- BEUG, JAMES L. (1973) ..... Computer Science  
B.A., Northwestern University, 1962; Sc.M., Ohio State University, 1971; Ph.D., 1974. Professor.
- BEYER, EDGAR H. (1981) ..... Crop Science  
B.S., University of Illinois, 1958; M.S., Purdue University, 1963; Ph.D., 1964. Associate Professor.
- BEYMER, CHARLES R. (1966) ..... University Library  
B.S., University of Wisconsin, 1950; M.L.S., 1955; additional graduate study, University of Wisconsin, University of California, Berkeley. Interim Director.
- BIRKETT, RICHARD J. (1955) ..... Animal Sciences and Industry  
B.S., California State Polytechnic College, 1953; M.S., Kansas State University, 1963. Professor.
- BLATTNER, ERNEST W. (1983) ..... Mechanical Engineering  
M.S., Swiss Federal Institute, Zurich, 1953. Professor. Registered Professional Engineer, Utah.
- BLODGET, ROBERT L. (1974) ..... Psychology and Human Development  
B.A., Willamette University, 1965; Ed.D., University of Massachusetts, 1973. Associate Professor.
- BLUM, MICHAEL L. (1981) ..... Graphic Communication  
B.A., University of California, Los Angeles, 1971; M.A., Rochester Institute of Technology, 1979. Associate Professor.
- BOBELE, H. KENNETH (1981) ..... Management  
B.S., University of California, Los Angeles, 1963; Ph.D., 1970. Associate Professor.
- BOCHE, RAYMOND E. (1969) ..... Computer Science  
B.S., California State Polytechnic College, San Luis Obispo, 1958; M.S., San Jose State College, 1966; Ph.D., Texas Tech University, 1971. Professor.
- BOJORQUEZ, MARTHA (1984) ..... Student Academic Services  
B.A., California Polytechnic State University, San Luis Obispo, 1977; M.A., 1984. Academic Coordinator Upward Bound.
- BONDS, ROBERT V. (1972) ..... Learning Assistance Center  
B.A., San Jose State College, 1965; M.S., University of California, Los Angeles, 1972; M.A., California Polytechnic State University, 1978; additional graduate study, University of California, Santa Barbara. Counselor.
- BOONE, JOSEPH C. (1968) ..... Physics  
B.A., Earlham College, 1962; M.A., University of Wisconsin, 1967; Ph.D., 1970. Professor.
- BOOTH, JAMES S. (1972) ..... Biological Sciences  
B.S., Los Angeles State College, 1959; M.S., University of Southern California, 1962; Ph.D., 1968. Associate Professor.
- BOSTROM, ROBERT M. (1956) ..... Housing  
B.S., California State Polytechnic College, 1956; M.A., 1970. Director.
- BOTWIN, MICHAEL (1981) ..... Architectural Engineering  
B.S., University of Miami, 1962; M.S., Rensselaer Polytechnic Institute, 1964; Ph.D., 1968. Professor.
- BOWKER, LESLIE S. (1974) ..... Biological Sciences  
B.S., University of Massachusetts, 1963; M.S., Rutgers University, 1965; Ph.D., Washington State University, 1974. Professor.
- BOYNTON, WILLIAM C. (1985) ..... Accounting  
B.S., Northeastern University, 1967; M.B.A., Michigan State University, 1968; Ph.D., 1976. Professor and Department Head.
- BRADY, MARY L. (1968) ..... University Library  
B.A., Mundelein College, 1960; M.A.L.S., Rosary College, 1966; M.A., California Polytechnic State University, 1978. Librarian.
- BRAEZEAL, CONNIE R. (1966) ..... Home Economics  
B.A., California State Polytechnic College, 1960; M.A., 1966. Associate Professor.
- BRECKENRIDGE, PATRICIA HAMER (1975) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, San Luis Obispo, 1970; M.L.A., California State Polytechnic University, Pomona, 1979; additional graduate study, California Polytechnic State University. Associate Professor.

## 610 Faculty and Staff

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- BREMER, WALTER D. (1981) ..... Landscape Architecture  
B.F.A., Mankato State University, 1973; M.L.A., Utah State University, 1977. Associate Professor.
- BRENNER, PATRICIA A. (1970) ..... English  
B.S., Bob Jones University, 1957; M.A., Middlebury College, 1963; Ph.D., Kent State University, 1970. Professor.
- BRODIE, DAVID A. (1970) ..... Architecture  
B.Arch., University of Capetown, South Africa, 1953; M.Arch., University of California, Berkeley, 1964. Professor.
- BROWN, BARBARA, P. (1981) ..... Student Health Services  
State Registered Nurse, St. Margaret's Hospital, England, 1957; Postgraduate Certificate in Operating Theatre Technique, 1958; additional study, Fresno State College, 1963; R.N., California, 1963; B.S.N., California State College, Bakersfield, 1980. Public Health Certificate.
- BROWN, CARL R.V. (1982) ..... English  
B.A., Arizona State University, 1971; M.A., 1972; Ph.D., Stanford University, 1977. Assistant Professor.
- BROWN, GEORGE M., III (1982) ..... Agricultural Engineering  
B.S., University of California, Davis, 1973; Assistant Professor.
- BROWN, JOHANNA B. (1969-1973) (1974) ..... University Library  
B.A., Saint Mary's College, 1966; M.L.S., State University of New York at Geneseo, 1967. Associate Librarian.
- BROWN, KENNETH L. (1980) ..... Engineering Technology  
B.V.E., California Polytechnic State University, 1979; M.A., 1980. Assistant Professor.
- BROWN, ROBERT J. (1969) ..... Biological Sciences  
B.S., California State College, Los Angeles, 1964; M.S., Arizona State University, 1967; Ph.D., University of Toronto, Canada, 1972. Professor.
- BROWN, RONALD F. (1974) ..... Physics  
B.A., University of California, Riverside, 1962; M.A., 1964; Ph.D., 1968. Professor.
- BROWN, RUSSELL H. (1978) ..... Student Affairs  
B.A., Whitworth College, 1958; M.A., University of Nebraska, 1960; Ph.D., 1967. Dean of Students.
- BROWN, WILLIAM H. (1957) ..... Architecture  
B.Arch., University of Florida, 1954; M.Arch., 1968; additional graduate study, University of Sydney. Professor.  
Registered Architect, California.
- BRUG, RICHARD C. (1978) ..... Business Affairs  
B.A., California State University, Long Beach, 1974. Director Public Safety.
- BRULEY, DUANE F. (1984) ..... School of Engineering  
B.S., University of Wisconsin, 1956; M.S., Stanford University, 1959; Ph.D., University of Tennessee, 1962. Dean.
- BRUMLEY, RICHARD L. (1981) ..... University Library  
B.S., Utah State University, 1963; M.S., 1965; M.L.S., University of California, Berkeley, 1975. Associate Librarian.
- BRYAN, HENRY L., CPT(P) (1984) ..... Military Science  
B.S., Brigham Young University, 1974; M.P.A., 1978.
- BUCCOLA, VICTOR A. (1962) ..... Physical Education and Recreation Administration  
B.S., California State Polytechnic College, 1956; M.A., 1957; Ed.D., Arizona State University, 1972. Professor.
- BUCICH, RICHARD A. (1963) ..... Electronic and Electrical Engineering  
B.S., Illinois Institute of Technology, 1954; M.S., 1956. Assistant Professor.
- BUFFA, ANTHONY J. (1970) ..... Physics  
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Illinois, 1966; Ph.D., 1969. Professor.
- BURGUNDER, LEE B. (1983) ..... Business Administration  
B.A., Dartmouth College, 1977; M.B.A., Stanford University, 1981; J.D., 1981. Associate Professor.
- BURNS, CHARLOTTE B. (1974) ..... Ornamental Horticulture  
B.A., University of California, Los Angeles, 1951; M.A., 1978, California Polytechnic State University, San Luis Obispo; graduate study, University of Hawaii; University of California, Berkeley and Irvine. Professor.
- BURRELL, SHEL A. (1973) ..... Placement Center  
B.A., University of California, San Diego, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1981. Associate Director.
- BURROUGHS, SARAH E. (1967) ..... Food Science and Nutrition  
B.S. and Certificate in Medical Technology, University of Michigan, 1956; Ph.D., University of California, 1967. Professor.
- BURT, CHARLES M. (1978) ..... Agricultural Engineering  
B.S., California Polytechnic State University, 1973; M.S., Utah State University, 1975; Ph.D., 1983. Professor.  
Registered Civil Engineer and Agricultural Engineer, California.

- BURT, WALLACE H. (1968) ..... Accounting  
B.S., University of California, 1949; M.B.A., University of Denver, 1962; M.P.A., University of Southern California, 1975. Associate Professor. Certified Public Accountant.
- BURTON, JOSEPH B. (1981) ..... Architecture  
B.Arch., M.Arch., University of Texas, 1975; Ph.D., University of Pennsylvania, 1983. Assistant Professor.
- BURTON, ROBERT E. (1968) ..... History  
A.B., San Diego State College, 1962; M.A., University of Oregon, 1964; Ph.D., 1969. Professor.
- BUSSELEN, HARRY J., JR. (1975) ..... School of Professional Studies and Education  
B.S., California State College, Sacramento, 1959; M.S., 1962; Ph.D., Florida State University, 1970; additional graduate study, University of Oregon. Professor and Interim Dean.
- BUTLER, J. KENT (1977) ..... Industrial Engineering  
B.S., Arizona State University, 1961; M.S., 1963; Ph.D., 1971. Professor.
- BUXBAUM, JAMES M. (1978) ..... Business Administration  
B.A., Harvard College, 1949; J.D., Columbia University Law School, 1955; M.A., Claremont Graduate School, 1976; Ph.D., 1978; additional study, University of Paris, Hague Academy of International Law. Professor.
- BYARS, NAN A. (1985) ..... Engineering Technology  
B.S., Clemson University, 1978; M.S., West Virginia University, 1981. Associate Professor. Registered Professional Engineer, South Carolina.
- CAIN, DAVID J. (1980) ..... Counseling Services  
B.A., University of Richmond, 1966; M.S., Virginia Commonwealth University, 1968; Ph.D., University of Wyoming, 1972; Diplomate in Clinical Psychology of American Board of Professional Psychology. Psychologist.
- CAIRNS, EDWARD A. (1969) ..... English  
B.A., Stanford University, 1956; M.A., San Francisco State University, 1963; Ph.D., University of Denver, 1971. Associate Professor.
- CAMP, ROGER C. (1984) ..... Computer Science  
B.S., Oklahoma State University, 1955; M.S., Iowa State University, 1957; Ph.D., 1962. Professor.
- CANO, RAUL J. (1974) ..... Biological Sciences  
B.S., Eastern Washington State College, 1970; M.S., 1972; Ph.D., University of Montana, 1974. Professor.
- CANTU, R. DAVID (1980) ..... Student Academic Services  
B.S., California State Polytechnic University, San Luis Obispo, 1969; M.S., 1974; M.A., 1975. Director Minority Engineering Program.
- CAREY, CATHRYN GAIL (1978) ..... Student Health Services  
A.R.R.T., C.R.T. Santa Monica Hospital 1961; postgraduate work, Cedars Sinai and Loma Linda Hospitals. Radiologic Technologist.
- CARNEGIE, E. J. (1963-64) (1965) ..... Agricultural Engineering  
B.S., California State Polytechnic College, 1962; M.Engr., University of California, Davis, 1963. Professor and Department Head. Registered Mechanical Engineer, California.
- CARPENTER, THOMAS W. (1968) ..... Aeronautical Engineering  
B.S., Virginia Polytechnic Institute, 1961; M.S., 1964; Ph.D., Purdue University, 1969. Professor.
- CARR, JANICE L. (1983) ..... Accounting  
B.S., California State University, Northridge, 1971; M.S., 1975; Ph.D., Arizona State University, 1985. Associate Professor. Certified Public Accountant.
- CARTER, LARK P. (1981) ..... School of Agriculture  
B.S., Iowa State University, 1953; M.S., 1956; Ph.D., 1960. Dean.
- CARY, ARTHUR S. (1974) ..... Physics  
B.A., Fisk University, 1949; M.A., 1951; Ph.D., University of California, Riverside, 1969. Professor.
- CASEY, GLEN R. (1982) ..... Agricultural Education  
B.S., Chico State College, 1966; M.S., California Polytechnic State University, San Luis Obispo, 1979. Assistant Professor.
- CENSULLO, ALBERT C. (1974) ..... Chemistry  
B.S., Villanova University, 1969; Ph.D., Pennsylvania State University, 1975. Professor.
- CHAMBERLAIN, JANE (1980) ..... Placement Center  
B.S., California Polytechnic State University. Career Placement Adviser.
- CHAMBERS, WILLIAM C. (1985) ..... Industrial Technology  
B.S., United States Naval Academy, 1953; M.S., Air Force Institute of Technology, 1959. Associate Professor. Registered Professional Engineer, Ohio.
- CHAPMAN, ARTHUR J. (1972) ..... Architecture  
B.S., B.Arch., California State Polytechnic College, 1970; M.S., Pennsylvania State University, 1971; additional graduate study, University of California, Los Angeles. Professor.

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- CHEDA, ARCHIE D. (1980) ..... Engineering Technology  
B.S., California State Polytechnic College, 1969; M.S., University of Minnesota, 1978. Associate Professor.  
Registered Professional Engineer, California.
- CHEEK, DONALD K. (1973) ..... Education  
B.S., Seton Hall University, 1953; M.S.W., Fordham School of Social Service, 1955; Ph.D., Temple University,  
1971. Professor.
- CHESTNUT, F. STUART (1963) ..... Physical Education and Recreation Administration  
B.S., Indiana University, 1951; M.S., 1963; additional graduate study, Indiana University, University of Oregon.  
Professor.
- CHEW, MARIE (1976) ..... Student Health Services  
R.N., St. Joseph College, Maryland; 1959; B.S., 1959. ANA Board Certificate, 1983. Nurse Practitioner.
- CHIPPING, DAVID H. (1971) ..... Physics  
B.S., Cambridge University, England, 1965; M.S., Stanford University, 1967; Ph.D., 1970. Professor.
- CHIRICA, LAURIAN M. (1984) ..... Computer Science  
M.S., University of Bucharest, Romania, 1964; Ph.D., University of California, Los Angeles, 1976. Professor.
- CHIZEK, GAYLORD J. (1958) ..... Agricultural Management  
B.S., Kansas State College, 1957; M.S., 1958; additional graduate study, Oregon State University. Professor.
- CHOU, THOMAS T. L. (1961) ..... Electronic and Electrical Engineering  
B.S., Chinese National Chekiang University, 1947; M.S., University of Washington, 1956; additional graduate  
study, University of California, Los Angeles and Berkeley. Professor.
- CHRISTENSON, ROBERT A. (1970) ..... Psychology and Human Development  
B.S., University of Utah, 1963; M.S., Brigham Young University, 1968; Ph.D., 1970. Professor.
- CIANO, DAVID A. (1973) ..... Financial Aid  
B.A., University of Redlands, 1966; J.D., University of California, Los Angeles, 1972. Counselor.
- CICHOWSKI, ROBERT S. (1971) ..... Chemistry  
B.S., Purdue University, 1964; Ph.D., Alfred University, 1968. Professor.
- CIRONE, JOAN M. (1971) ..... Student Health Services  
R.N., Cuesta College, 1971; Nurse Practitioner, University of California, Los Angeles, 1974; B.S.N., California State  
College, Bakersfield, 1979; M.A., California Polytechnic State University, San Luis Obispo, 1983; M.P.A., Univer-  
sity of San Francisco, 1983. Supervising Nurse.
- CIROVIC, MICHAEL M. (1968) ..... Electronic and Electrical Engineering  
B.E., New York University, 1965; M.S., 1968. Professor.
- CLARK, WILLIAM E. (1977) ..... Mechanical Engineering  
B.M.E., University of Minnesota, 1964; M.S., 1966; Ph.D., 1972. Professor. Registered Professional Engineer,  
California.
- CLAUSE, ODILE M. (1976) ..... Foreign Languages  
B.A., University of Wyoming, 1967; M.A., 1968; Ph.D., University of Colorado, 1975. Associate Professor.
- CLENDENEN, HARRIET (1977) ..... Student Academic Services  
B.A., Central Michigan State University, 1953; M.A., California Polytechnic State University, 1979. Coordinator  
of Disabled Student Services.
- CLERKIN, EDWARD J. (1964) ..... Electronic and Electrical Engineering  
B.S., Colorado State University, 1950; M.S., University of Idaho, 1962; additional graduate study, Utah State  
University, Colorado State University, Oklahoma University. Professor. Registered Professional Engineer,  
California.
- CLOGSTON, FRED L. (1960) ..... Biological Sciences  
B.A., B.S., Western Washington College, 1950; M.S., University of Washington, 1956; Ph.D., 1965. Professor.
- CLOONAN, CLIFFORD B. (1957) ..... Electronic and Electrical Engineering  
B.S., University of Colorado, 1955; M.S., Montana State University, 1961; Ph.D., University of Colorado, 1975.  
Professor.
- COATS, DONALD M. (1964) ..... Enrollment Support Services  
B.S., California State Polytechnic College, 1964; M.A., 1969. Associate Dean, Educational Services.
- COCHRAN, BURT, JR. (1976) ..... Student Health Services  
M.D., University of Southern California Medical School, 1949. Medical Officer.
- COCHRANE, MONA (1970) ..... Student Health Services  
R.N., Knapp College of Nursing, Santa Barbara, 1953. Nurse Practitioner.
- COE, ROBERT K. (1978) ..... Management  
B.S., 1957; M.B.A., 1958; Ph.D., Syracuse University, 1963; B.A., California State College, Bakersfield, 1977.  
Professor.



- COLEMAN, JAMES W. (1973) ..... Social Sciences  
B.A., California State University, Northridge, 1969; M.A., University of California, Santa Barbara, 1971; Ph.D., 1975. Professor and Department Head.
- COLEMAN, WILLIE M. (1980) ..... Student Life and Activities  
B.A., San Francisco State College, 1966; M.S.W., University of California, Berkeley, 1971; Ph.D., University of California, Irvine, 1982. Assistant Director.
- COLLINS, CARL L., LTC (1984) ..... Military Science  
B.S., Oklahoma State University, 1966; M.S., Georgia Institute of Technology, 1974. Department Head.
- COLOMÉ, JAIME S. (1972) ..... Biological Sciences  
B.A., University of California, Santa Barbara, 1966; M.A., 1973; Ph.D., 1974. Professor.
- COLVIN, MICHAEL R. (1979) ..... Mathematics  
B.A., University of Houston, 1968; M.A., 1970; Ph.D., 1976. Associate Professor.
- CONNELY, JOHN B. (1970) ..... Education  
B.A., University of Southern California, 1958; Ph.D., 1970. Professor.
- CONNER, E. WESLEY (1963) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, 1956; M.Phil., University of Nottingham, England, 1974. Professor. Registered Landscape Architect, California.
- CONWAY, JAMES R. (1969) ..... Speech Communication  
B.A., California State College, Los Angeles, 1966; M.A., 1968; Ph.D., University of Southern California, 1977. Associate Professor.
- CONWAY, ROGER (1984) ..... Associate Students, Inc./University Union  
A.B., Rutgers University, 1966; M.A., University of Rhode Island, 1969; P.S.O.D., National Training Labs, Alexandria, Virginia, 1975. Executive Director.
- COOK, BARBARA E. (1972) ..... Social Sciences  
A.B., Duke University, 1965; M.A., Stanford University, 1967; Ph.D., 1974. Associate Professor.
- COOMBS, LEE CHARLES (1969) ..... Chemistry  
B.A., San Diego State College, 1963; M.S., 1965; Ph.D., Purdue University, 1970. Professor.
- COOPER, ALAN F. (1970) ..... Biological Sciences  
B.S., California State Polytechnic College, Pomona, 1964; Ph.D., University of California, Riverside, 1969. Professor.
- COOPER, ALLAN R. (1975) ..... Architecture  
B.A., Rice University, 1967; B.Arch., 1968; M.Arch., Cornell University, 1971. Professor. Registered Architect, California.
- COOPER, MARK A. (1978) ..... Engineering Technology, Information Systems  
B.S., California State Polytechnic College, 1968; M.S., Arizona State University, 1978. Associate Professor and Director Computer-Aided Productivity Center.
- COOPER, MARY P. (POLLY) (1981) ..... Architecture  
B.A., Wellesley College, 1963; M.Ed., Harvard University, 1964; M.Arch., University of California, Berkeley, 1971; M.L.A., 1974. Associate Professor. Registered Architect, California.
- COTA, HAROLD M. (1966) ..... Civil and Environmental Engineering  
B.S., University of California, 1959; M.S., Northwestern University, 1960; Ph.D., Oklahoma University, 1966. Professor. Registered Professional Engineer, California; Diplomat of the Academy of Environmental Engineers.
- COTKIN, GEORGE B. (1980) ..... History  
B.A., Brooklyn College (C.U.N.Y.), 1972; M.A., Ohio State University, 1974; Ph.D., 1978. Associate Professor.
- CRABB, A. CHARLES (1978) ..... Crop Science  
B.S., University of California, Davis, 1973; M.S., Bowling Green State University, 1974. Associate Professor.
- CRIVELLO, JOHN H. (1971) ..... Intercollegiate Athletics  
B.S., California State University, San Jose, 1969; M.S., California Polytechnic State University, 1970. Coach.
- CRUIKSHANKS, RANDAL L. (1972) ..... Political Science  
B.A., University of California, Berkeley, 1963; M.A., University of Oregon, 1965; Ph.D., 1968; additional graduate study, University of Michigan. Professor.
- CULVER, JOHN H. (1975) ..... Political Science  
B.S., University of Oregon, 1968; M.S., 1970; Ph.D., University of New Mexico, 1975. Professor and Department Head.
- CURRIER, SUSAN (1980) ..... English  
B.A., Mount Holyoke College, 1969; M.A., University of Massachusetts, 1970; Ph.D., 1979. Associate Professor.
- CURTIS, WILLIAM D. (1961) ..... Psychology and Human Development  
B.A., University of Redlands, 1948; M.A., University of California, Los Angeles, 1951; Ph.D., University of Denver, 1960. Professor.

- CURZON, GORDON (1970) ..... English  
B.S., DePaul University, 1941; B.A., St. Mary's College, 1945; M.A., Western Washington State University, 1966;  
Ph.D., University of California, Riverside, 1969. Professor.
- D'ALBRO, JAMES A. (1969) ..... Ornamental Horticulture  
B.S., Cornell University, 1966; M.S., University of California, Davis, 1969; Ph.D., Michigan State University, 1980.  
Professor.
- DALTON, LINDA C. (1983) ..... City and Regional Planning  
A.B., Radcliffe/Harvard, 1967; M.U.P., University of Washington, 1974; Ph.D., 1978. Associate Professor.
- DALY, C. JOY (1985) ..... University Union  
B.A., Queens College, C.U.N.Y., 1974; M.Ed., University of Rhode Island, 1976; M.H.A., Washington University,  
St. Louis, 1983. Assistant Director Operations.
- DALY, JAMES C. (1972) ..... Statistics  
B.S., Gonzaga University, 1966; Ph.D., Oregon State University, 1973. Professor and Interim Department Head.
- DANA, CHARLES H. (1982) ..... Computer Science  
B.A., University of California, Santa Barbara, 1972; M.S., 1974; Ph.D., 1981. Associate Professor.
- DANES, JEFFREY E. (1986) ..... Business Administration  
B.A., San Jose State University, 1972; M.A., 1974; Ph.D., Michigan State University, 1976. Professor.
- DARNIELLE, MAX E. (1967) ..... English  
B.S., University of Oregon, 1950; M.S., Indiana University, 1967; additional graduate study, Indiana University.  
Assistant Professor.
- DATTA, SAMIR KUMAR (1968) ..... Electronic and Electrical Engineering  
B.E.E., Jadavpur University, Calcutta, India, 1958; M.S., University of Manchester, England, 1963; Ph.D., 1966.  
Professor.
- DAVIDMAN, LEONARD (1977) ..... Education  
B.A., Brooklyn College, 1966; M.A., 1972; Ph.D., Stanford University, 1976. Associate Professor.
- DAVIDSON, OTTO C. (1968) ..... Mechanical Engineering  
B.S., Bucknell University, 1955; M.S., Massachusetts Institute of Technology, 1956; Ph.D., Stanford University,  
1960. Professor. Registered Professional Engineer, California.
- DAVIES, THOMAS H. (1983) ..... Music  
B.M.E., Bowling Green State University, 1975; M.A., 1977; D.M.A., University of Southern California, 1983.  
Assistant Professor.
- DAVIS, DONNA (1984) ..... Placement Center  
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A. 1977. Career Placement Adviser.
- DAVIS, KIM (1979) ..... Engineering Technology  
B.E., Southern Technical Institute, 1978; M.S., Rochester Institute of Technology, 1978; Associate Professor.
- DAVIS, M. LeROY (1976) ..... Agricultural Management  
B.S., California State Polytechnic College, 1966; M.S., Iowa State University, 1968; Ph.D., Colorado State University,  
1973. Professor and Department Head.
- DAVIS, MARJORIE A. (1976) ..... Student Health Services  
B.S., University of Oklahoma, 1956; C.L.T., M.T., A.S.C.P., P.H. Microbiologist. Supervising Clinical Laboratory  
Technologist.
- DeJONG, ALVIN A. (1974) ..... Biological Sciences  
B.S., Seattle Pacific College, 1965; Ph.D., Washington State University, 1972. Professor.
- DeJONG, AUGUST (1976) ..... Counseling Services  
B.A., Hope College, 1952; M.A., Chapman College, 1967; Ed.D., University of Southern California, 1975. Career  
Development Counselor.
- DeKLEINE, GLORIA J. (1983) ..... Student Health Services  
B.A., Western Michigan University, 1964; School of Medical Technology, Borgess Hospital, 1965. M.T., A.S.C.P.,  
California Licensed Clinical Laboratory Technologist. Clinical Laboratory Technologist.
- DeKLEINE, H. ARTHUR (1974) ..... Mathematics  
B.S., Western Michigan University, 1964; M.A., 1965; Ph.D., University of California, Riverside, 1968. Professor.
- DELANY, JAMES E. (1970) ..... Mathematics  
A.B., San Diego State College, 1961; Ph.D., Iowa State University, 1966. Professor.
- DeLATOUR, CHRISTOPHER (1978) ..... Physics  
B.S., Georgetown University, 1969; M.S., Massachusetts Institute of Technology, 1971; Ph.D., 1974. Associate  
Professor.
- DeLEY, WARREN W. (1971) ..... Social Sciences  
A.B., Stanford University, 1956; M.A., 1957; M.A., University of California, Los Angeles, 1963; C. Phil., 1968;  
Ph.D., 1970. Professor.

- DELVAGLIO, PETER A. (1970) ..... Graphic Communication  
B.S., Rochester Institute of Technology, 1963; M.A., California Polytechnic State University, 1973. Assistant Professor.
- DENEL, MUSTAFA BILGI (1981) ..... Architecture  
B.S., Robert College, Istanbul, 1959; M.F.A., Princeton University, 1963; Ph.D., Technical University of Istanbul, 1981. Professor. Registered Civil Engineer and Architect, Turkey.
- DENSHAM, ROBERT S. (1980) ..... Art and Design  
B.A., California State University, Long Beach, 1967; M.F.A., 1980. Associate Professor.
- DETTLOFF, ERLAND G. (1967) ..... Education  
B.S., Minot State College, 1956; M.A., University of Wyoming, 1962; Ed.D., 1963. Professor.
- DEVORE, JAY L. (1977) ..... Statistics  
B.S., University of California, Berkeley, 1966; M.S., Stanford University, 1968; Ph.D., 1971; additional graduate study, Sheffield University, England. Professor.
- DIAZ, JOE V. (1976) ..... Counseling Services  
B.A., University of Arizona, 1970; M.Ed., 1971; Ph.D., 1976. Counselor and Career Planning Services Coordinator.
- DICKERSON, ARTHUR F. (1980) ..... Electronic and Electrical Engineering  
B.S., University of Texas, 1946; M.S., University of Southern California, 1980. Assistant Professor. Registered Professional Engineer, California.
- DICKERSON, ROBERT H. (1970) ..... Physics  
B.S., University of Arizona, 1959; M.S., 1963; Ph.D., 1964. Professor.
- DICKEY, RICHARD K. (1956) ..... Electronic and Electrical Engineering  
B.S., University of California, 1948; M.S., 1956; Ph.D., University of California, Santa Barbara, 1969. Professor. Registered Professional Engineer, California.
- DILLS, CHARLES E. (1963) ..... Chemistry  
B.S., North Dakota State University, 1949; M.S., George Washington University, 1951; Ph.D., Harvard University, 1956. Professor.
- DILLS, KEITH W. (1983) ..... Art and Design  
B.A., State University of Iowa, 1961; M.A., San Francisco State College, 1969; Ph.D., University of California, Berkeley, 1981. Associate Professor.
- DIMMITT, LAURA SAENZ (1975) ..... Financial Aid  
B.A., University of California, Santa Barbara, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1980. Scholarship Program Manager.
- DING, GAR DAY (1985) ..... School of Architecture and Environmental Design  
B.Arch., University of Auckland, New Zealand, 1953; B.E. University of Canterbury, New Zealand, 1959; M.Eng.Sc., University of New South Wales, Australia, 1961. Professor and Dean. Registered Architect and Engineer, Australia; Registered Architect, New Zealand.
- DINGUS, DELMAR D. (1973) ..... Soil Science  
B.S., Berea College, 1966; M.S., West Virginia University, 1968; Ph.D., Oregon State University, 1973. Professor.
- DIRKES, LOIS M. (1973) ..... Counseling Services  
B.S., University of California, Los Angeles, 1958; M.S., University of Maryland, 1963; Ph.D., 1973. Counselor.
- DOMINGUES, ANTHONY (1984) ..... Student Academic Services  
B.S., California Polytechnic State University, San Luis Obispo, 1978; graduate study, Humboldt State University, California Polytechnic State University, San Luis Obispo. Director Special Services for the Disadvantaged.
- DOMPKE, JOANNE (1982) ..... Student Health Services  
R.N., Cuesta College, 1976. Registered Nurse.
- DONALDSON, DOUGLAS D. (1968) ..... Biological Sciences  
A.B., University of California, Berkeley, 1962; M.A., California State College, Los Angeles, 1964; Ph.D., Oklahoma State University, 1969. Professor.
- DONNELL, JAMES R. (1977-1979) (1982) ..... Cooperative Education  
B.S., California State University, Long Beach, 1976; M.B.A., California Polytechnic State University, San Luis Obispo, 1980. Coordinator.
- DOURSON, ROBERT H. (1967) ..... Computer Science  
B.S., California Institute of Technology, 1935; M.S., 1941; Ch.E., 1942; additional graduate study, Case Institute of Technology, Southern Illinois University, University of California, Berkeley. Professor.
- DRANDELL, MILTON (1972) ..... Management  
B.A., Southern Methodist University, 1944; M.A., University of Texas, 1945; Ph.D., University of California, Los Angeles, 1951. Professor.

## 616 Faculty and Staff

- DRESSENDORFER, RUDOLPH H. (1985) ..... Physical Education and Recreation Administration  
B.S., University of California, Davis, 1965; M.A., 1971; Ph.D., University of Hawaii, School of Medicine, 1974.  
Associate Professor.
- DRUCKER, HOWARD (1980) ..... Education  
B.A., Hunter College of the City of New York, 1957; M.A., 1961; Ph.D., Florida State University, 1972. Associate  
Professor.
- DUARTE, ARTHUR C. (1965) ..... Agricultural Management  
B.S., California State Polytechnic College, 1964; M.S., Oregon State University, 1965; Ph.D., Washington State  
University, 1975. Professor.
- DUERK, DONNA (1980) ..... Architecture  
B.Arch., B.A., Massachusetts Institute of Technology, 1972; M.Arch., 1981. Associate Professor. Registered  
Architect, Texas.
- DUFFY, D. JAN (1980) ..... Business Administration  
B.A., Stanford University, 1972; J.D., Case Western Reserve University, 1976. Professor.
- DUNDON, STANISLAUS J. (1970) ..... Philosophy  
B.A., Mt. Carmel College, 1962; M.A., St. John's University, 1965; Ph.D., 1972. Professor.
- DUSEK, BERNARD W. (1965) ..... Art and Design  
A.B., University of California, Santa Barbara, 1951; M.A., University of Southern California, 1960; additional  
graduate study, La Jolla California Art Center. Professor.
- DWYER, GARY COLBURN (1973) ..... Landscape Architecture  
B.F.A., Syracuse University, 1967; B.S.L.A., New York State University, 1967; M.A., University of Denver, 1970.  
Professor.
- EASTHAM, GEORGE M. (1966) ..... Economics  
B.A., Chico State College, 1961; M.A., University of California, Santa Barbara, 1965; Ph.D., Claremont Graduate  
School, 1978. Professor.
- EATOUGH, NORMAN L. (1968) ..... Chemistry  
B.S., Brigham Young University, 1957; B.E.S., 1958; M.S., 1959; M.S.Ch.E., University of Washington, 1960; Ph.D.,  
Brigham Young University, 1968. Professor.
- ECKLUND, VICTOR, J. (1982) ..... Intercollegiate Athletics  
B.S., California Polytechnic State University, San Luis Obispo, 1973. Coach.
- EDMISTEN, JOHN W. (1968) ..... Architectural Engineering  
B.S., California State Polytechnic College, 1965; M.Eng., University of California, Berkeley, 1967. Professor.  
Registered Civil Engineer, California; Registered Architect, California.
- EGGEN, NORMAN R. (1976) ..... Food Science and Nutrition  
B.S., California State Polytechnic College, Kellogg, 1970; M.S., Texas A & M University, 1974. Professor.
- EHRENBERG, JAMES R. (1977) ..... Engineering Technology  
B.S., Gonzaga University, 1960; M.S., Seattle University, 1969; Ed.D., Brigham Young University, 1982. Professor.  
Registered Professional Engineer, California.
- ELTZROTH, THOMAS E. (1967) ..... Ornamental Horticulture  
B.S., Ohio State University, 1965; M.S., 1966. Professor.
- ELEY, S. CURTIS (1985) ..... Cooperative Education  
B.S., Texas A & M University, 1981. Coordinator.
- EMMEL, JAMES R. (1967) ..... Speech Communication  
B.A., Eastern Nazarene College, 1945; Speech Therapy Certification, Northwestern University, 1946; M.A.,  
University of Oklahoma, 1950; Ph.D., Pennsylvania State University, 1959. Professor.
- ENDRES, LELAND S. (1969) ..... Chemistry  
A.B., Middlebury College, 1958; M.A., University of Oregon, 1963; Ph.D., University of Arizona, 1966. Professor.
- ENGLE, PATRICIA L. (1980) ..... Psychology and Human Development  
B.A. Wellesley College, 1966; Ph.D., Stanford University, 1971. Associate Professor.
- ENGLUND, DAVID L. (1973) ..... Psychology and Human Development  
B.A., Ohio State University, 1956; M.A., University of Hawaii, 1965; Ph.D., University of Wisconsin, 1969.  
Professor.
- EPSTEIN, GARY M. (1969) ..... Mathematics  
B.A., University of California, Riverside, 1964; Ph.D., 1969. Professor.
- EQUINOIA, RICHARD M. (1973) ..... Placement Center  
B.S., California State Polytechnic College, San Luis Obispo, 1967; M.S., 1970. Director.
- ERICSON, JON M. (1970) ..... School of Liberal Arts  
B.A., Pacific Lutheran College, 1952; M.A., Stanford University, 1953; Ph.D., 1961. Dean.

- FABRICIUS, EUGENE DAVID (1970) ..... Electronic and Electrical Engineering  
B.S., Missouri School of Mines, Rolla, 1956; M.S., 1958; D.Sc., Newark College of Engineering, New Jersey, 1968.  
Professor.
- FAHS, MICHAEL L. (1983) ..... Speech Communication  
A.B., California State College, Long Beach, 1972; M.A., University of Southern California, 1974; Ph.D., 1976.  
Associate Professor.
- FARRELL, GERALD P. (1970) ..... Mathematics  
A.B., San Diego State College, 1961; M.S., 1963; Ph.D., University of California, Los Angeles, 1968. Professor.
- FEDERER, M. DALE (1963) ..... Psychology and Human Development  
B.S., University of Wyoming, 1951; M.Ed., 1961; Ph.D., 1962. Professor.
- FELDMAN, JACOB (1971) ..... Architectural Engineering  
B.S., University of Delaware, 1961; M.S., 1968. Professor. Registered Civil Engineer, California.
- FERREIRA, LESLIE S. (1978) ..... Dairy Science  
B.S., California State Polytechnic College, 1970; M.S., University of Illinois, 1972; Ph.D., Utah State University, 1980. Professor.
- FIELD, GARY G. (1984) ..... Graphic Communication  
Higher Trade Certificate, Melbourne College of Printing and Graphic Arts, Australia, 1966; Diploma in Printing Technology, Trent Polytechnic, England, 1970; M.B.A., University of Pittsburgh, 1975. Associate Professor.
- FIESTINE, HARRY L. (1966) ..... School of Science and Mathematics  
B.S., Long Beach State College, 1957; M.A., University of California, Los Angeles, 1961; Ph.D., 1965. Professor and Associate Dean.
- FIORITO, BASIL A. (1977) ..... Psychology and Human Development  
B.A., Marist College, 1968; M.S., New York University, 1970; M.A., 1975; Ph.D., Syracuse University, 1977.  
Associate Professor and Department Head.
- FITZPATRICK, MICHAEL JOHN (1975) ..... Electronic and Electrical Engineering  
B.S., California State Polytechnic College, San Luis Obispo, 1962; M.S., Ph.D., University of California, Santa Barbara, 1975. Professor.
- FLANAGAN, JAMES ROBERT (1959) ..... Animal Sciences and Industry  
B.S., California State Polytechnic College, 1959; M.S., 1974. Professor.
- FLEISHON, NEIL L. (1985) ..... Physics  
S.B., Massachusetts Institute of Technology, 1973; M.A., University of California, Berkeley, 1975; Ph.D., 1979.  
Associate Professor.
- FLORES, ANTHONY B. (1979) ..... Business Affairs  
B.A., California State University, Fullerton, 1973; M.P.A., University of Southern California, 1979; additional graduate study, University of California, Irvine, University of Southern California, California Polytechnic State University, San Luis Obispo. Financial Manager.
- FLORES, ROBERT A. (1983) ..... Agricultural Education  
B.S., California Polytechnic State University, San Luis Obispo, 1977; M.S., 1978. Assistant Professor.
- FLOYD, DONALD R. (1974) ..... Social Sciences  
B.A., University of California, Berkeley, 1967; M.A., 1968; Ph.D., 1976. Professor.
- FORGENG, WILLIAM D. (1980) ..... Metallurgical Engineering  
B.Met.E., Cornell University, 1958; Ph.D., Purdue University, 1962. Associate Professor.
- FORT, TOMLINSON, JR. (1982) ..... Chemistry and Metallurgical Engineering  
B.S., University of Georgia, 1952; M.S., University of Tennessee, 1957; Ph.D., 1957; postdoctoral research, University of Sydney, Australia. Professor.
- FOSTER, THEODORE C. (1970) ..... Physics  
B.S., University of Santa Clara, 1961; M.S., University of Washington, 1963; Ph.D., 1965. Professor.
- FOUNTAIN, H. PAUL (1965) ..... Crop Science  
B.S., California State Polytechnic College, 1963; M.S., University of California, Davis, 1974. Professor.
- FOX, FRANK W. (1957) ..... Animal Sciences and Industry  
B.S., California State Polytechnic College, 1951; M.A., 1957. Professor.
- FREEMAN, H. JOANNE (1975) ..... Industrial Engineering  
B.I.E., Georgia Institute of Technology, 1966; M.S., University of Southern California, 1974; Ph.D., Stanford University, 1982. Professor. Registered Professional Engineer, California.
- FRENCH, STEVEN P. (1981) ..... City and Regional Planning  
B.A., University of Virginia, 1971; M.U.R.P., University of Colorado, 1973; Ph.D., University of North Carolina, 1980. Associate Professor.
- FREY, DENNIS F. (1970) ..... Biological Sciences  
B.S., Oklahoma State University, 1963; M.S., Virginia State College, 1967; Ph.D., Oklahoma State University, 1970. Professor.

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- FREY, THOMAS G. (1970) ..... Chemistry  
B.A., University of Oregon, 1965; Ph.D., University of Idaho, 1970. Professor.
- FREY, WINTON H. (1972) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, 1958; M.S., Fresno State University, 1972. Professor.
- FRIEDMAN, FRED S. (1975) ..... Engineering Technology  
B.S., University of California, Santa Barbara, 1969; M.S., Loyola University, Los Angeles, 1972. Professor. Registered Professional Engineer, California.
- FRIETZSCHE, ARTHUR H. (1965) ..... English  
B.A., University of California, 1944; M.A., 1945; Ph.D., 1949. Professor.
- FUJITANI, SHARON H. (1977) ..... University Library  
B.A., University of California, Santa Barbara, 1963; M.L.S., University of Hawaii, 1974; M.A., Pepperdine University, 1976. Senior Assistant Librarian.
- GAINES, MERRILL C. (1976) ..... Architecture  
B.B.A., University of Wisconsin 1965; M.Arch. 1973. Associate Professor. Registered Architect, Wisconsin.
- GALLAGHER, GAIL (1978) ..... Student Health Services  
B.S., California State Polytechnic College, 1970; R.N., Cuesta College, 1972. Registered Nurse.
- GAMBLE, LYNNE E. (1976) ..... University Library  
B.A., University of Texas at Austin, 1968; M.L.S., 1969; M.A., California Polytechnic State University, San Luis Obispo, 1979. Assistant to Director.
- GAMBS, ROGER D. (1974) ..... Biological Sciences  
B.S., University of Idaho, 1963; M.S., 1965; Ph.D., University of Montana, 1973. Professor.
- GANG, DONNA D. (1967) ..... Student Health Services  
R.N., Regina General Hospital, Canada, 1953; N.P., California Polytechnic State University, San Luis Obispo, 1976; B.S., California State College, Bakersfield, 1983; Certificate in Public Health Nursing, California, 1983. Nurse Practitioner.
- GARNER, EDWARD R. (1967) ..... Mechanical Engineering  
B.S., Bradley University, 1962; M.S., University of Arizona, 1965; Ph.D., Montana State University, 1973. Professor.
- GASCOIGNE, HAROLD E. (1984) ..... Mechanical Engineering  
B.S.M.E., University of Kansas, 1957; M.S.E., University of Michigan, 1959; Ph.D., 1968. Professor. Registered Professional Engineer, Utah.
- GASKIN, TIMOTHY A. (1970) ..... Ornamental Horticulture  
B.S., University of California, 1954; M.S., University of Delaware, 1956; Ph.D., Purdue University, 1958; M.B.A., Ohio State University, 1968. Professor.
- GAY, LARRY W. (1979) ..... Industrial Technology  
B.A., California Polytechnic State University, 1975; M.A., 1976; Ed.D., Brigham Young University, 1980. Professor. Licensed General Contractor.
- GEDAYLOO, TEYMOOR (1965) ..... Physics  
B.A., Macalester College, 1957; M.S., University of Washington, 1959; Ph.D., University of Kansas, 1973. Professor.
- GENEREUX, DOUGLAS G. (1970) ..... Agricultural Management  
B.S., University of Nebraska, 1964; M.S., 1969; Ph.D. Colorado State University, 1979. Professor.
- GEOGHAGEN, LOCKSLEY (1977) ..... Student Academic Services  
B.A., University of California, Los Angeles, 1970; M.A., California Polytechnic State University, 1976; A.B.D., University of California, Santa Barbara; additional graduate study. Associate Director.
- GEORGE, DAVID L. (1970) ..... Political Science  
A.B., San Diego State College, 1962; M.A., 1968; Ph.D., University of Oregon, 1970; additional graduate study, Yale University, University of Michigan Survey Research Center. Professor.
- GERARD, E. DOUGLAS (1951) ..... Facilities Administration  
B.S., University of British Columbia, 1950; M.S., University of Saskatchewan, 1951. Executive Dean.
- GILLHAM, JOHN F. (1975) ..... Landscape Architecture  
B.L.A., University of Oregon, 1962; M.L.A., 1966. Professor.
- GIROLO, JACK E. (1970) ..... Mathematics  
B.A., San Jose State, 1964; M.S., Iowa State University, 1966; Ph.D., 1971. Professor.
- GITTES, KATHARINE SLATER (1983) ..... English  
B.A., University of California, San Diego, 1972; M.A., San Diego State University, 1975; M.A., University of California, San Diego, 1981; Ph.D., 1983. Assistant Professor.
- GLASER, MARGARET J. (1973) ..... Education  
B.S., Marquette University, 1953; M.Ed., 1970; Ed.D., University of Arizona, 1973. Professor and Coordinator Liberal Studies.

- GLASS, L. JOE (1970) ..... Agricultural Engineering  
B.S., Purdue University, 1962; M.S., Texas A & M University, 1965; Ph.D., 1971. Professor. Registered Civil Engineer, California.
- GLASSCO, D. EDWARD (1968) ..... Mathematics  
B.S., Harvey Mudd College, 1963; M.A., University of Southern California, 1966; Ph.D., 1971. Professor.
- GLASSMEYER, SONJA M. (1979) ..... Physical Education and Recreation Administration  
B.S., California State Polytechnic State University, 1973; M.S., 1974; Ed.D., Brigham Young University, 1981. Associate Professor.
- GLIDDEN, WALLACE F. (1961) ..... Animal Sciences and Industry  
B.S., California State Polytechnic College, 1952; B.S., University of California, Davis, 1955; D.V.M., 1961. Professor.
- GOERS, JOHN W. F. (1980) ..... Chemistry  
B.S., University of Illinois, 1969; Ph.D., University of California, Los Angeles, 1974. Associate Professor.
- GOLDBERG, SAUL (1970) ..... Electronic and Electrical Engineering  
B.S., Fairleigh Dickinson University, 1963; M.E., University of Florida, 1964; Ph.D., 1968. Professor.
- GOLDENBERG, STUART (1970) ..... Mathematics  
B.S., University of California, Los Angeles, 1965; M.S., University of California, Riverside, 1969; Ph.D., 1970. Professor.
- GONIEWSKI, MARILYN P. (1978) ..... University Library  
B.A., LeMoyne College, 1971; M.S.L.S., University of Southern California, 1975; M.A., California Polytechnic State University, San Luis Obispo, 1981. Associate Librarian.
- GONZALES, LEONARD A. (1972) ..... Enrollment Support Services  
B.A., University of Maryland, 1966; M.A., Chapman College, 1979; additional graduate study, United States International University. Coordinator of Relations with Schools.
- GOODEN, REGINALD H., JR. (1970) ..... Political Science  
B.A., University of California, Los Angeles, 1962; M.A., University of California, Santa Barbara, 1969; Ph.D., 1972. Professor.
- GORDON, RAYMOND G. (1967) ..... Mechanical Engineering  
B.S., Western New England College, 1966; M.S., University of Michigan, 1967; Ph.D., University of California, Santa Barbara, 1974. Professor. Registered Professional Engineer, California.
- GORDON, ROBERT L. (1967) ..... Ornamental Horticulture  
B.S., California Polytechnic State University, 1981. Associate Professor.
- GOWGANI, GEORGE G. (1970) ..... Crop Science  
B.S., California State Polytechnic College, San Luis Obispo, 1964; M.A., 1968; M.S., University of Nevada, 1972; Ph.D., 1975. Professor.
- GRADY, DAVID V. (1971) ..... Biological Sciences  
A.B., University of California, Los Angeles, 1964; Ph.D., 1974. Professor.
- GRANNEMAN, GARY A. (1978) ..... Engineering Technology  
B.S., Iowa State University, 1962; M.S., 1972; Ph.D., 1978. Professor. Registered Professional Engineer, Iowa.
- GRANT, DONALD P. (1967) ..... Architecture  
B.Arch., University of Oklahoma, 1961; M.Arch., University of Utah, 1964; Ph.D., University of California, Berkeley, 1974. Professor. Registered Architect, California.
- GRAY, CONSTANCE H. (1976) ..... Biological Sciences  
B.S., University of Massachusetts, 1947; M.S., University of Hawaii, 1951; Ph.D., University of California, Berkeley, 1974. Professor.
- GRAYSON, RANDOLPH L. (1972) ..... Biological Sciences  
B.A., State University of Iowa, 1958; M.A., Washington University, 1963; Ph.D., Michigan State University, 1972. Professor.
- GRAZIANO, VICTOR (1982) ..... Student Academic Services  
B.S., Loyola University, 1968; M.S., Washington State University, 1970. Counselor and Academic Adviser.
- GREEN, DEBORAH K. (1982) ..... Cooperative Education  
B.A., California Polytechnic State University, San Luis Obispo, 1982; additional graduate study. Coordinator.
- GREENWALD, HARVEY C. (1973) ..... Mathematics  
B.S., Massachusetts Institute of Technology, 1964; M.A., Washington University, 1966; Ph.D., 1970. Professor.
- GRIFFIN, ROBERT E. (1976) ..... University Foundation  
B.S., University of Southern California, 1966; J.D., Western State University, 1974. Associate to Executive Director.
- GRIMES, JOSEPH E. (1973) ..... Computer Science, Information Systems  
B.A., St. Ambrose College, 1963; M.S., Illinois State University, 1968; Ph.D., Iowa State University, 1973. Professor and Interim Manager Computer Services.
- GRINDE, DONALD A., Jr. (1977) ..... History  
B.A., Georgia Southern College, 1966; M.A., University of Delaware, 1968; Ph.D., 1974. Associate Professor.

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- GRINNELL, ROBIN R. (1967) ..... Agricultural Engineering  
B.S., Purdue University, 1955; M.S., University of Minnesota, 1961; Ph.D., Purdue University, 1976. Professor.
- GROSZ, DAVID W. (1967) ..... Intercollegiate Athletics  
B.S., University of Oregon, 1960; M.S., 1965. Coach.
- GROVES, JOHN E. (1968) ..... Statistics  
B.A., Pasadena College, 1963; M.A., University of California, Riverside, 1965; Ph.D., Kansas State University, 1972. Professor.
- HAFEMEISTER, DAVID W. (1969) ..... Physics  
B.S., Northwestern University, 1957; M.S., University of Illinois, 1960; Ph.D., 1964. Professor.
- HAGEN, CHARLES T. (1980) ..... Philosophy  
B.A., Harvard University, 1968; M.A., University of Michigan, 1977; Ph.D., 1981. Associate Professor.
- HAGGARD, KENNETH L. (1967) ..... Architecture  
B.S., Texas A & M, 1958; B.Arch., North Carolina State University, 1963; M.Arch., University of Pennsylvania, 1967. Professor. Registered Architect, Florida and California.
- HALE, THOMAS E. (1966) ..... Mathematics  
B.S., Indiana State University, 1960; M.S., 1963; M.S., St. Louis University, 1967; Ph.D., 1972. Professor.
- HALISKY, LINDA H. (1984) ..... English  
B.A., Whittier College, 1968; M.A., University of California, Riverside, 1978; Ph.D., 1984. Assistant Professor.
- HALL, MICHAEL H. (1974) ..... Animal Sciences and Industry  
B.S., California Polytechnic State University, 1973; M.S., Kansas State University, 1975. Associate Professor.
- HALLMAN, BARBARA MCCLUNG (1973) ..... History  
B.A., California State University, Los Angeles, 1960; M.A., 1962; Ph.D., University of California, Los Angeles, 1974. Professor.
- HALLOCK, BRENT G. (1979) ..... Soil Science  
B.S., University of California, Davis, 1970; M.S., 1972; Ph.D., 1976. Associate Professor and Department Head. Certified Professional Soil Scientist.
- HALPERN, STANLEY D. (1983) ..... Annual Giving  
B.A., University of Washington, 1970; M.A., 1972; Ph.D., Bar Ilan University, Ramat Gan, Israel, 1980. Director.
- HAMPTON, EDWARD E., JR., CPT (P) (1985) ..... Military Science  
B.S., Cameron University, 1975; M.S., University of Southern California, 1984.
- HAMPTON, JOHN K., JR. (1976) ..... Biological Sciences  
B.S., Millsaps College, 1947; Ph.D., Tulane University Graduate School, 1949. Professor.
- HANES, STEPHEN L. (1984) ..... Engineering Technology  
B.A., University of Virginia, 1971; M.Eng., Old Dominion University, 1976. Associate Professor.
- HANNINGS, DAVID W. (1974) ..... Ornamental Horticulture  
B.S., Auburn University, 1972; M.S., Cornell University, 1974. Associate Professor.
- HANSEN, PHYLLIS JEAN (1963) ..... University Library  
A.B., University of Illinois, 1960; M.S., 1961; M.A., California Polytechnic State University, San Luis Obispo, 1984. Senior Assistant Librarian.
- HANSON, MICHAEL T. (1978) ..... Biological Sciences; Natural Resources Management  
B.S., Idaho State University, 1970; M.A., University of Missouri, 1973; Ph.D., Texas A & M University, 1976. Associate Professor.
- HARDEN, F. SHELDON (1948) ..... Physical Education and Recreation Administration  
B.A., Santa Clara, 1943; M.A., College of the Pacific, 1950. Professor.
- HARGRAVE, TERRY C. (1979) ..... Architecture  
B.Arch.Eng., Washington State University, 1965; M.Arch., Massachusetts Institute of Technology, 1978. Associate Professor. Registered Architect, Washington.
- HARMON-ELLIOTT, ADELAIDE T. (1974) ..... Mathematics  
B.S., Fordham University, 1955; M.S., 1964; Ph.D., New York University, 1969. Professor.
- HARPER, LOUIS W. (1977) ..... Crop Science  
B.S., Montana State University, 1958; M.S., 1964. Associate Professor.
- HARRIGAN, JOHN E., JR. (1969) ..... Architecture  
B.A., University of California, Berkeley, 1959; M.A., San Jose State College, 1962; Ph.D., Colorado State University, 1966. Professor.
- HARRIGAN, PAULINE W. (1983) ..... Housing  
B.S., University of Massachusetts, 1979; M.S.W., University of Connecticut, 1981. Coordinator of Student Development Programs.
- HARRINGTON, JOHN F. (1976) ..... English  
B.A., Washington State University, 1964; M.A., 1966; Ph.D., University of Illinois, 1970. Professor and Coordinator of Writing Skills Program.



- HARRIS, JAMES G. (1982) ..... Electronic and Electrical Engineering  
B.S., University of California, Berkeley, 1961; M.S., 1962; Ph.D., Syracuse University, 1968. Professor and Department Head.
- HARRIS, JOHN H. (1978) ..... Natural Resources Management  
B.S., Humboldt State College, 1968; M.S., 1970; Ph.D., Utah State University, 1972. Associate Professor.
- HARRIS, ROY M. (1954) ..... Animal Sciences and Industry  
B.S., Utah State Agricultural College, 1952; M.S., 1954; Ph.D., 1970. Professor.
- HARRIS, WALTER L. (1973) ..... Student Academic Services  
B.S., California Polytechnic State University, 1973; M.A., 1975. Outreach Adviser.
- HARTER, LANCE L. (1979) ..... Intercollegiate Athletics  
B.S., Texas Tech University, 1972; M.S., Colorado State University, 1974. Coach.
- HARTIG, DONALD G. (1979) ..... Mathematics  
B.S., Rensselaer Polytechnic Institute, 1964; M.S., University of Wisconsin, Milwaukee, 1966; Ph.D., University of California, Santa Barbara, 1970. Associate Professor.
- HASKELL, CHARLES THOMSON (1963) ..... Mathematics  
B.A., University of Washington, 1946; M.S., University of Arizona, 1961; Ph.D., 1965. Professor.
- HASSLEIN, GEORGE J. (1949) ..... Architecture  
B.Arch., University of Southern California, 1945. Professor. FAIA.
- HATCHER, DAVID S. (1980) ..... Architectural Engineering  
B.S., University of Wyoming, 1953; Ph.D., University of Illinois, 1961. Professor and Department Head. Registered Civil Engineer, California.
- HAVANDJIAN, NISHAN (1980) ..... Journalism  
B.A., Haigazian College, Lebanon, 1970; M.A., University of Georgia, 1972; Ph.D., University of Texas at Austin, 1979. Associate Professor.
- HAWES, MICHAEL (1967) ..... Engineering Technology  
B.Eng'r., University College, Dublin, Ireland, 1958; M.S., Ohio State University, 1967. Professor. Registered Professional Engineer, Ohio.
- HAWKINS, MAX F. (1984) ..... Animal Sciences and Industry  
B.S., Western Illinois University, 1975; M.S., University of Tennessee, 1979; Ph.D., 1984. Assistant Professor.
- HAWTHORNE, DANIEL L. (1973) ..... Psychology and Human Development  
B.A., University of Minnesota, 1968; M.A., University of California, Berkeley, 1970; Ph.D., 1973. Associate Professor.
- HAYDEN, JILL E. (1977) ..... Counseling Services  
B.A., University of California, Riverside, 1972; M.A., California Polytechnic State University, San Luis Obispo, 1976. Career Counselor.
- HAYES, JAMES H. (1969) ..... Journalism  
B.A., San Jose State College, 1950; M.A., University of Florida, 1966; additional graduate study, University of Minnesota. Professor.
- HAZEBROOK, HARRY (1968) ..... Electronic and Electrical Engineering  
B.S., Michigan College of Mining and Technology, 1949; M.S., University of Wisconsin, 1951. Professor.
- HEAD, DWAYNE G. (1966) ..... Physical Education and Recreation Administration  
B.S., Jamestown College, 1958; M.S., South Dakota State University, 1963; Ed.D., University of Oregon, 1967. Professor and Department Head.
- HEINZ, JOHN A. (1953) ..... Audiovisual Services  
B.A., University of Washington, 1950; M.A., Ohio State University, 1964. Director.
- HELLYER, GEORGE J. (1980) ..... Agricultural Management  
B.S., University of California, Davis, 1960; M.S., 1973. Associate Professor.
- HENDERSON, THOMAS R. (1982) ..... Intercollegiate Athletics  
B.A., Occidental College, 1975. Coach.
- HENRY, DAVID (1976) ..... Speech Communication  
A.B., University of California, Berkeley, 1970; M.A., University of California, Davis, 1974; Ph.D., Indiana University, 1976. Associate Professor.
- HENSEL, DONALD W. (1960) ..... History  
B.S., University of North Dakota, 1949; M.A., University of Colorado, 1953; Ph.D., 1957. Professor.

## 622 Faculty and Staff

- HEWITT, CLARISSA (1976) ..... Art and Design  
B.A., California State University, Northridge, 1971; M.F.A., Cranbrook Academy, 1976. Professor.
- HIEMSTRA, B. KRIS (1984) ..... Counseling Services  
B.A., California State University, Northridge, 1974; M.A., 1978. Career Counselor.
- HILL, PATRICK D. (1975) ..... Architecture  
B.Arch., University of Illinois, 1970; M.S., 1972. Professor. Registered Architect, Illinois and California.
- HILL, ROBERT W. (1976) ..... Accounting  
B.S., University of California, Berkeley, 1956; M.B.A., 1968; D.B.A., University of Southern California, 1975. Professor. Certified Public Accountant.
- HINKLE, MARY ANN (1978) ..... Financial Aid  
B.S., California State Polytechnic College, San Luis Obispo, 1969. GSL/CLAS Program Manager.
- HITCHCOCK, VAUGHAN D. (1962) ..... Physical Education and Recreation Administration  
B.S., Washington State University, 1956; M.A., San Francisco State College, 1965. Professor.
- HIXSON, DOROTHY F. (1974) ..... Student Health Services  
R.N., Salem Hospital School of Nursing, 1945; graduate study, University of California, Santa Barbara Extension, Cuesta College. Registered Nurse.
- HOCKADAY, STEPHEN L.M. (1982) ..... Civil and Environmental Engineering  
B.S., London University, 1965; M.S., University of California, Berkeley, 1968; Ph.D., 1969. Professor and Interim Department Head. Registered Professional Engineer, California.
- HODGES, WILLIAM R. (1985) ..... Engineering Technology  
B.Eng., Georgia Institute of Technology, 1975; M.S., 1976. Associate Professor.
- HOFFMAN, KENNETH A. (1974) ..... Physics  
B.A., University of California, Berkeley, 1966; M.A., 1969; Ph.D., 1973. Professor.
- HOFFMANN, JON A. (1968) ..... Aeronautical Engineering  
B.S., University of Wisconsin, 1964; M.S., 1966; additional graduate study, Wisconsin State University. Professor. Registered Professional Engineer, California.
- HOLDER, ELAINE E. (1979) ..... Psychology and Human Development  
B.A., University of Colorado, Boulder, 1948; M.A., New Mexico State University, 1951; Ph.D., University of Missouri, Columbia, 1956. Associate Professor.
- HOLLAND, V. L. (1972) ..... Biological Sciences  
B.A., Fresno State College, 1966; M.A., 1969; Ph.D., University of California, Berkeley, 1973. Professor and Department Head.
- HOLLSTIEN, ROY B. (1973-1976) (1980) ..... Computer Science  
B.S., California State Polytechnic College, San Luis Obispo, 1958; M.S., University of Michigan, 1967; Ph.D., 1971. Professor.
- HOLZ, ALAN W. (1974) ..... Mathematics  
B.A., University of Washington, 1963; M.A., Bowdoin College, 1968; Ph.D., Purdue University 1972. Professor.
- HOMAN, DENNIS N. (1966) ..... Biological Sciences  
B.A., University of Iowa, 1955; M.S., 1958; Ph.D., 1960. Professor.
- HONEGGER, HARRY H. (1961) ..... Metallurgical Engineering  
B.S., Oregon State College, 1950; M.S., 1952. Professor. Registered Professional Engineer, California and Oregon.
- HOOD, J. MYRON (1977) ..... Mathematics  
B.A., Grinnell College, 1963; M.S., Northwestern University, 1965; Ph.D., Washington University, 1970. Associate Professor.
- HOOKS, ROBERT D. (1966) ..... Animal Sciences and Industry  
B.S., California State Polytechnic College, 1961; M.S., Iowa State University, 1964; Ph.D., 1966. Professor.
- HOOVER, ROBERT L. (1970) ..... Social Sciences  
A.B., University of California, Berkeley, 1965; M.A., 1969; Ph.D., 1971; additional graduate study, University of California, Berkeley, Stanford University. Professor.
- HORTON, WILLIAM F. (1968) ..... Electronic and Electrical Engineering  
B.S., California Institute of Technology, 1946; M.S., 1948; Ph.D., University of California, Los Angeles, 1966. Professor.
- HOULGATE, LAURENCE D. (1979) ..... Philosophy  
B.A., California State University, Los Angeles 1960; M.A., Ph.D., University of California, Los Angeles, 1967. Professor.
- HOULIS, JEROME F. (1959) ..... Chemistry  
B.S., California State Polytechnic College, 1958; graduate study, California State Polytechnic College. Assistant Professor.

- HOWARD, LORRAINE H. (1964) ..... Student Affairs  
B.S., Oregon State College, 1945; Ed.M., Oregon State University, 1961; Ph.D., 1964. Associate Dean.
- HOWARD, PATRICIA W. (1982) ..... Cooperative Education  
B.A., University of Denver, 1958; M.A., 1959. Assistant Director.
- HOWARD, WILLIAM A. (1980) ..... City and Regional Planning  
B.A., University of Denver, 1958; M.A., 1960; graduate study, Johns Hopkins University, 1961-63; Ph.D. University of Edinburgh, 1973. Professor and Department Head.
- HOWELL, ROBERT (1974) ..... Art and Design  
B.A., Brooks Institute, 1973; M.A., Pepperdine University, 1976. Professor.
- HSIEH, CARL C. F. (1970) ..... Civil and Environmental Engineering  
B.S., National Taiwan University, 1961; M.S., So. Dakota School of Mines and Technology, 1965; Ph.D., Northwestern University, 1968. Professor. Registered Professional Engineer, California.
- HSU, JOHN Y. S. (1970) ..... Computer Science  
B.S., National Taiwan University, 1959; M.S., University of California, Berkeley, 1964; Ph.D., 1969. Professor.
- HUEHN, KEMPTON L. (1968) ..... Mathematics  
B.S., Iowa State University, 1957; M.S., 1962; Ph.D., Colorado School of Mines, 1974. Professor.
- HUFF, EARL D. (1970) ..... Political Science  
B.A., San Francisco State College, 1959; M.A., University of Idaho, 1969; Ph.D., 1971. Professor.
- HUNT, ROGER M. (1979) ..... Animal Sciences and Industry  
B.S., California State Polytechnic College, 1971; M.S., 1978. Assistant Professor.
- HUOT, ROBERT J. (1963) ..... English  
B.A., University of Washington, 1946; M.A., 1951; Ph.D., University of Utah, 1971; additional graduate study. Professor.
- HUTCHINSON, JAMES R. (1971) ..... Graphic Communication  
B.F.A., Carnegie Institute of Technology, 1955; B.S., 1959; M.A., California State University, Dominguez Hills, 1977. Professor.
- HUTTON, REX L. (1966) ..... Mathematics  
B.S., Baldwin Wallace College, 1959; M.S., Illinois Institute of Technology, 1964; Ed.D., Arizona State University, 1972. Professor.
- HYNES, C. DENNIS (1957) ..... Biological Sciences  
B.A., Macalester College, 1951; M.S., University of Michigan, 1953; Ph.D., University of Florida, 1957. Professor.
- IANNCE, MICHAEL A. (1978) ..... Mechanical Engineering  
B.S., Valparaiso University, 1961; M.S., University of California, Los Angeles, 1968; Ph.D., 1971. Professor.
- IKENOYAMA, GEORGE K. (1964) ..... Architecture  
B.S., California State Polytechnic College, 1955; M.Arch., University of Hawaii, 1972. Professor. Registered Architect, California.
- INCHAUSTI, ROBERT L. (1984) ..... English  
B.A., California State University, Sacramento, 1964; M.A., 1976; Ph.D., University of Chicago, 1981. Assistant Professor.
- IQBAL, M. ZAFAR (1979) ..... School of Business  
B.S., University of Nevada, Reno, 1969; M.B.A., Northern Illinois University, 1972; Ph.D., University of Nebraska, Lincoln, 1979. Professor and Associate Dean. Certified Public Accountant, Certificate in Management Accounting, Certified Internal Auditor, Certified Cost Analyst.
- IRVIN, GLENN W. (1986) ..... Academic Programs  
B.A., Arizona State University, 1964; M.A., 1971; Ph.D., 1978. Vice Provost.
- JACOBS, JAMES W. (1967) ..... Animal Sciences and Industry  
B.S., Oklahoma State University, 1967; M.S., California Polytechnic State University, 1975. Professor.
- JACOBSON, RALPH A. (1975) ..... Chemistry  
B.A., Montclair State College, 1962; Ph.D., Cornell University, 1966. Professor.
- JAMESON, GLORIA (1967) ..... English  
B.A., Texas Woman's University, 1941; M.A., Teacher's College, Columbia University, 1944; Ph.D., University of Texas, 1966. Professor.
- JAMIESON, LYNN M. (1980) ..... Physical Education and Recreation Administration  
B.A., Muskingum College, 1968; M.S., Indiana University, 1976; Rec.D., 1980. Associate Professor.
- JANKAY, PETER (1973) ..... Biological Sciences  
B.A., San Fernando Valley State University, 1966; M.S., 1969; Ph.D., University of California, Santa Barbara, 1973. Professor.
- JEFFERSON, DOROTHY (1982) ..... Student Academic Services  
B.A., Los Angeles State College, 1957; M.A., California Polytechnic State University, 1977. Academic Adviser.

## 624 Faculty and Staff

- JENKINS, STARR (1961) ..... English  
B.A., University of New Mexico, 1948; M.A., Stanford University, 1959; Ph.D., University of New Mexico, 1972.  
Professor.
- JENNINGS, CHARLES W. (1968) ..... Art and Design  
B.A., Wheaton College, 1966; M.A., M.F.A., Northern Illinois University, 1968. Professor.
- JERICICH, GEORGE D. (1976) ..... Art and Design  
B.A., San Jose State University, 1972; M.A., 1976; M.F.A., 1983. Associate Professor.
- JOHNSON, BOYD WALKER (1969) ..... Mathematics  
B.S., United States Naval Academy, 1951; M.S., North Carolina State College, 1956; Ph.D., North Carolina State University, 1963. Professor.
- JOHNSON, CORWIN M. (1961) ..... Crop Science  
B.S., State College of Washington, 1950; M.S., 1951; Ph.D., Cornell University, 1953. Professor and Department Head.
- JOHNSON, ERIC B. (1980) ..... Art and Design  
B.S., University of Oregon, 1971; M.A., University of New Mexico, 1975; M.F.A., 1978. Associate Professor.
- JOHNSON, ERIC V. (1969) ..... Biological Sciences  
B.A., Brown University, 1964; Ph.D., Cornell University, 1969. Professor.
- JOHNSON, MICHAEL W. (1980) ..... Economics  
B.A., Washington State University, 1970; M.A., Ph.D., Northwestern University, 1977. Assistant Professor.
- JOHNSON, RICHARD F. (1950) ..... Animal Sciences and Industry  
B.S., Iowa State College, 1942; M.S., State College of Washington, 1947. Professor.
- JOHNSON, WILLIAM V. (1966) ..... Music  
B.M.E., Indiana University, 1962; M.M., University of Michigan, 1966. Professor.
- JONES, DANE R. (1976) ..... Chemistry  
B.A., University of Utah, 1969; Ph.D., Stanford University, 1974. Professor.
- JONES, JACK B. (1969) ..... Education  
B.A., University of California, Santa Barbara, 1957; M.A., 1965; Ed.D., University of Arizona, 1970; U.S. Army Command and General Staff College, 1975. Professor.
- JONES, RICHARD L., LTC (1981) ..... Military Science  
B.S., United States Military Academy, 1966; M.S., New Mexico State University, 1974. Department Head.
- JORGENSEN, NANCY ANN (1968) ..... Counseling Services  
B.A., University of Hawaii, 1957; M.A., California Polytechnic State University, San Luis Obispo, 1985; additional graduate study, Institute of Psychology, University of Paris, University of Hawaii, University of California at Santa Barbara, University of Nevada at Reno. Professor and Counselor.
- KALATHIL, JAMES S. (1965) ..... Physics  
B.S., University of Madras, 1956; M.A., Southern Illinois University, 1963; Ph.D., University of Nevada, 1977. Professor.
- KAMINAKA, M. STEPHEN (1984) ..... Agricultural Engineering  
B.S., University of California, Davis, 1968; M.S., University of Hawaii, 1973; Ph.D., Cornell University, 1977. Associate Professor.
- KAMINER, WILLIAM F. (1984) ..... Agricultural Management  
B.A., Vanderbilt University, 1974; M.I.M., American Graduate School of International Management, Glendale, Arizona; Ph.D., Mississippi State University, 1984. Associate Professor.
- KANN, DAVID J. (1969) ..... English  
B.A., Brandeis University, 1964; M.A., New York University, 1966; Ph.D., Occidental College, 1971. Professor.
- KATEKARU, JAMES Y. (1969) ..... Chemistry  
B.S., University of Oregon, 1956; M.S., University of Arizona, 1961; Ph.D., University of Cincinnati, 1965. Professor.
- KATO, GORO C. (1981) ..... Mathematics  
B.S., Shizuoka University, Japan, 1972; M.A., West Virginia University, 1974; Ph.D., University of Rochester, 1979. Associate Professor.
- KATO, KIYOSHI (1985) ..... Business Administration  
B.S., Nagoya Institute of Technology, Japan, 1973; M.S., 1975; M.B.A., University of Utah, 1983; Ph.D., 1985. Associate Professor.
- KAY, THOMAS D. (1958) ..... Engineering Technology  
B.S., Wayne State University, 1957; M.A., California State Polytechnic College, 1967. Professor.
- KEARNS, TIMOTHY J. (1985) ..... Computer Science  
B.A., Boston College, 1969; M.S., University of Notre Dame, 1970; Ph.D., 1976. Associate Professor.

- KEELING, DAVID L. (1975) ..... Chemistry  
B.S., Arizona State University, 1969; Ph.D., University of Hawaii, 1974. Professor.
- KEEP, ROGER L. (1968) ..... Industrial Technology  
B.S., Brigham Young University, Hawaii, 1967; M.S., Stout State University, 1968; Ed.D., Utah State University, 1972. Professor. Licensed General Contractor.
- KEETCH, BRENT H. (1967) ..... English  
B.A., Utah State University, 1965; M.A., 1966; Ph.D., University of Utah, 1971. Professor.
- KEIF, RODNEY G. (1960) ..... Mechanical Engineering  
B.S., Kansas State University, 1949; M.S., Kansas State University, 1975. Professor. Registered Professional Engineer, California.
- KEIL, DAVID J. (1976) ..... Biological Sciences  
B.S., Arizona State University, 1968; M.S., 1970; Ph.D., Ohio State University, 1973. Professor.
- KELLER, ELMO A., JR. (1963) ..... Computer Science  
B.A., Brigham Young University, 1959; M.A., 1961; Ph.D., Iowa State University, 1972. Professor.
- KELLERMAN, MARTIN A. (1968) ..... Chemistry  
B.S., Polytechnic Institute of Brooklyn, 1953; Ph.D., University of Washington, 1966. Associate Professor.
- KELLOGG, WILLIAM C. (1983) ..... Agricultural Education  
B.S., California Polytechnic State University, San Luis Obispo, 1976; M.S., 1983. Assistant Professor.
- KENNEDY, EUEL W. (1974) ..... Mathematics  
B.S., East Central State College, 1962; M.S., University of Utah, 1964; Ph.D., 1972. Professor.
- KENTES, PETER S. (1985) ..... Theatre and Dance  
B.S., Eastern Michigan University, 1972; M.F.A., University of Michigan, 1978; additional graduate study, California Institute of the Arts. Assistant Professor.
- KENVIN, ROGER L. (1983) ..... Theatre and Dance  
A.B., Bowdoin College, 1949; M.A., Harvard University, 1956; M.F.A., Yale University, 1959; D.F.A., 1961. Professor and Department Head.
- KERBO, HAROLD R. (1977) ..... Social Sciences  
B.A., University of Oklahoma, 1970; M.A., 1972; Ph.D., Virginia Polytechnic Institute and State University, 1975. Associate Professor.
- KERSTEN, TIMOTHY W. (1971) ..... Economics  
B.A., Sacramento State College, 1967; M.A., University of Oregon, 1970; Ph.D., 1973. Professor.
- KESNER, BRIAN B. (1980) ..... Architecture  
B.Arch., University of California, Berkeley, 1967; M.Arch., 1978. Professor.
- KHAN, M. ZAHIR (1984) ..... Engineering Technology  
B.Eng., University of Poona, India, 1972; M.S., Ohio State University, 1976. Associate Professor. Registered Professional Engineer, Kentucky.
- KIM, CHI SU (1974) ..... University Library  
B.A., Dan Kook University, Seoul, Korea, 1959; M.A., University of Oregon, 1967; M.L.S., 1969. Librarian.
- KNABLE, ANTHONY E. (1973) ..... Biological Sciences; Natural Resources Management  
B.A., Blackburn College, 1965; M.A., Southern Illinois University, 1967; Ph.D., 1972. Professor.
- KNECHT, GEORGE N. (1973) ..... Biological Sciences  
B.S., Rutgers University, 1962; M.S., 1969; Ph.D., University of Arizona, 1975. Professor.
- KOBERG, DONALD J. (1962) ..... Architecture  
B.Arch., Tulane University, 1958; M.Arch., University of Washington, 1970. Professor. Registered Architect, Louisiana.
- KOHNEN, KEN (1983) ..... Architecture  
B.S., California State Polytechnic College, San Luis Obispo, 1966; B.Arch., 1967; M.Arch., Sheffield University, England, 1982. Associate Professor. Registered Architect, California.
- KOLKAILAH, FAYSAL A. (1984) ..... Aeronautical Engineering  
B.S., Cairo University, Egypt, 1969; M.S., University of Cincinnati, 1978; Ph.D., Louisiana State University, 1982; additional graduate study, Cairo University. Associate Professor. Registered Professional Engineer, Egypt.
- KOURAKIS, JOSEPH M. (1970) ..... City and Regional Planning  
B.A., University of Illinois, 1954; M.Arch., University of Illinois, 1957; M.C.R.P., University of California, Berkeley, 1961. Professor. Registered Architect, California.
- KRANZDORF, RICHARD B. (1971) ..... Political Science  
A.B., University of Pennsylvania, 1958; M.A., 1959; M.A., University of California, Los Angeles, 1970; Ph.D., 1973. Professor.

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- KREJSA, RICHARD J. (1968) ..... Biological Sciences  
B.S., Michigan State College, 1954; M.A., University of California, Los Angeles, 1958; Ph.D., University of British Columbia, Vancouver, 1964. Professor.
- KRIEGER, DANIEL E. (1971) ..... History  
B.A., San Jose State College, 1965; Ph.D., University of California, Davis, 1973. Professor.
- KUBINSKI, A. MARK (1975) ..... Biological Sciences  
B.S., Gonzaga University, 1968; M.S., Washington State University, 1971; Ph.D., 1974. Professor.
- LABHARD, LEZLIE A. (1967) ..... Home Economics  
B.S., University of California, Davis, 1965; M.S., 1967. Associate Professor.
- LAKEMAN, SANDRA D. (1981) ..... Architecture  
B.S., University of Cincinnati, 1960; M.Arch., University of Oregon, 1977. Associate Professor. Registered Architect, Oregon.
- LAMB, STEPHAN R. (1979) ..... Housing  
B.A., Santa Clara University, 1973; M.A., University of the Americas, 1975. Associate Director.
- LAMBERT, ROYCE L. (1969) ..... Soil Science  
B.S., Purdue University, 1964; M.S., 1966; Ph.D., 1969. Professor. Certified Professional Soil Scientist, Certified Professional Soil Erosion and Sediment Control Specialist.
- LAMBERT, WALTER M. (1975) ..... Student Life and Activities  
B.A., California State College, Long Beach, 1962. Coordinator of Greek Affairs.
- LAMOURIA, LLOYD H. (1965) ..... Agricultural Engineering  
B.S., Michigan State University, 1949; M.S., Iowa State University, 1950. Professor. Registered Agricultural Engineer, California.
- LANDRETH, JAMES R. (1956) ..... Business Affairs  
B.A., Mexico City College, 1954; M.B.A., Stanford University, 1956; additional graduate study, Claremont University College, California Polytechnic State University, San Luis Obispo. Director.
- LANDWEHR, ALFRED W. (1970) ..... English  
B.A., University of Missouri, 1963; M.A., 1964; Ph.D., 1970. Professor.
- LANG, MARTIN T. (1969) ..... Mathematics  
B.A., North Central College, Illinois, 1959; M.A., University of Kansas, 1963; Ph.D., University of Texas at Austin, 1973. Professor.
- LANGE, JOHN H. (1975) ..... Architecture  
B.S., University of Cincinnati, 1968; M.Arch., Stanford University, 1972; Ph.D., University of Pennsylvania, 1975. Professor. Registered Architect, California.
- LANT, KATHLEEN MARGARET (1983) ..... English  
B.A., University of Illinois, 1971; M.A., University of Oregon, 1975; Ph.D., 1982. Assistant Professor.
- LAPORTE, MARY L. (1985) ..... Art and Design  
B.A., Washington State University, 1975; M.F.A., 1980. Associate Professor.
- LARSEN, STUART E. (1969) ..... Civil and Environmental Engineering  
B.S., University of Cincinnati, 1963; M.S., 1965; M.S., Arizona State University, 1969. Professor.
- LaSALLE, TIMOTHY J. (1974) ..... Dairy Science  
B.S., California State Polytechnic College, 1970; M.S., Virginia Polytechnic Institute and State University, 1972. Professor.
- LASCOLA, RUSSELL A. (1970) ..... Philosophy  
B.A., California State Los Angeles, 1962; M.A., University of Southern California, 1964; Ph.D., 1969. Professor.
- LASSANSKE, DANIEL E. (1974) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, San Luis Obispo, 1970; M.S., 1971. Associate Professor.
- LAZERE, DONALD P. (1977) ..... English  
B.A., Northwestern University, 1958; M.A., Columbia University, 1964; Ph.D., University of California, Berkeley, 1973. Professor.
- LEBENS, FRANK T. (1972-78) (1981) ..... Office of the Provost  
B.S., Iowa State University, 1964; M.B.A., California Polytechnic State University, 1972; M.A., 1975. Director of Operations.
- LEE, PETER Y. (1981) ..... School of Engineering  
B.S., National Taiwan University, 1961; M.S. Tulane University, 1965; Ph.D., 1968. Associate Dean. Registered Professional Engineer, Louisiana.
- LEE, THOMAS J. (1952) ..... Physical Education and Recreation Administration  
B.A., San Jose State University, 1949; M.A., Stanford University, 1950; M.A., Los Angeles State University, 1971. Professor.

- LEMMON, DON C. (1981) ..... Mechanical Engineering  
B.S., University of Utah, 1943; M.S., Pennsylvania State University, 1948; Ph.D., Rensselaer Polytechnic Institute, 1964. Professor. Registered Professional Engineer, Massachusetts.
- LEONESIO, ROBERT B. (1972) ..... Metallurgical Engineering  
B.S., University of Massachusetts, 1963; M.S., Stanford University, 1964; Ph.D., Lehigh University, 1970. Professor. Registered Professional Engineer, California.
- LEONG, KINGSTON L. (1970) ..... Biological Sciences  
B.S., University of Hawaii, 1963; M.S., 1966; Ph.D., Oregon State University, 1970. Professor.
- LEVENSON, HARVEY R. (1983) ..... Graphic Communication  
B.S., Rochester Institute of Technology, 1967; M.S., South Dakota State University, 1968; Ph.D., University of Pittsburgh, 1980. Department Head.
- LEVISON, ROBERT L. (1969) ..... Education  
B.S., Southern Oregon College, 1963; M.Ed., University of Wyoming, 1966; Ed.D., New Mexico State University, 1972. Professor.
- LEWIS, GEORGE M. (1967) ..... Mathematics  
B.A., Stanford University, 1961; M.A., University of Southern California, 1964; Ph.D., 1970. Professor.
- LEWIS, RODGER C. (1977) ..... University Library  
B.A., University of Miami, 1950; M.A., 1953; M.A., Florida State University, 1957. Associate Librarian.
- LI, ELDON Y. (1982) ..... Management  
B.Commerce, National Chengchi University, Taiwan, 1975; M.S.B.A., Texas Tech University, 1978; Ph.D., 1981. Associate Professor.
- LILJE, KARL D. (1981) ..... Engineering Technology  
B.S., Pennsylvania State University, 1957; M.S., New York University, 1960. Professor. Registered Professional Engineer, Ohio.
- LINDVALL, JOHN R. (1973) ..... Business Administration  
B.A., Whitman College, 1962; M.B.A., Indiana University, 1971; Ph.D., 1973. Professor.
- LINSTRUM, HELEN M. (1970) ..... Enrollment Support Services  
B.A., University of California, Los Angeles, 1961; M.A., California State Polytechnic College, San Luis Obispo, 1970. Counselor, Relations with Schools.
- LINT, ROBERT G. (1967) ..... English  
A.B., University of Michigan, 1948; M.A., 1948, 1950; Ph.D., Ohio University, 1967. Professor.
- LITTLE, H. CLAY (1973) ..... Agricultural Management  
B.S., University of Missouri, 1950; M.S., 1957; Ph.D., 1965. Professor.
- LITTLE, WILLIAM T. (1983) ..... Foreign Languages  
B.A., California State College, Northridge, 1966; M.A., Indiana University, 1968; Ph.D., Washington University, 1973. Professor and Department Head.
- LIU, MEI-LING (1985) ..... Information Systems  
M.S., Iowa State University, 1974; M.B.A., California Polytechnic State University, 1981. Assistant Manager Computer Systems.
- LO, CHIEN-KUO (1983) ..... Civil and Environmental Engineering  
B.S., National Cheng Kung University, 1969; M.S., 1973; Ph.D., University of Iowa, 1981. Associate Professor.
- LOCASCIO, JAMES GASPARE (1981) ..... Mechanical Engineering  
B.S., Newark College of Engineering, 1970; M.S., University of California, Santa Barbara, 1971; additional graduate study. Associate Professor.
- LOE, NANCY E. (1982) ..... University Library  
B.A., Aurora College, 1975; M.S., M.A., Catholic University of America, 1977. Senior Assistant Librarian.
- LOFTUS, ROBIN L. (1978) ..... Financial Aid  
B.A., California Polytechnic State University, San Luis Obispo, 1976; M.A., 1978. Assistant Director.
- LOH, ALICE C. (1974) ..... Landscape Architecture  
B.Arch., University of Manitoba, 1966; M.L.A., University of Oregon, 1972. Professor.
- LOH, LARRY (1979) ..... Architecture  
B.Arch., University of Manitoba, Canada, 1965; M.Arch. in U.D., Washington University, 1969. Professor. Registered Architect, Canada.
- LONG, DIANNE N. (1982) ..... Political Science  
B.S., State University of New York College at Buffalo, 1964; M.P.A., Michigan State University, 1977; Ph.D., 1982. Associate Professor.
- LORD, DAVID (1985) ..... Architecture  
B.S., University of Arizona, 1966; M.Arch., University of California, Berkeley, 1972; additional graduate study, University of London. Professor.

- LOWRY, JOHN J. (1962) ..... Mathematics  
B.S., United States Military Academy, West Point, 1947; M.A., California State Polytechnic College, 1963; M.S., University of Illinois, 1967; Ed.D., Arizona State University, 1974. Professor.
- LUCAS, NANCY (1977) ..... English  
B.A., Incarnate Word College, 1964; M.A., University of Illinois, 1966; Ph.D., 1973. Associate Professor.
- LUCAS, ROBERT A. (1975) ..... Research Development  
A.B., John Carroll University, 1961; M.A., University of Illinois, 1963; Ph.D., 1970. Director.
- LUNA, GEORGE W. (1977) ..... Mathematics  
B.A., University of California, Santa Barbara, 1962; M.A., University of California, Los Angeles, 1965; Ph.D., University of Washington, 1973. Associate Professor.
- LUND, MICHAEL W. (1984) ..... Animal Sciences and Industry  
B.S., North Dakota State University, 1970; M.S., 1981. Assistant Professor.
- LUTHRA, SHAM S. (1972) ..... Computer Science  
B.A., Punjab University, India, 1952; M.A., 1954; M.S., University of Alberta, Canada, 1969; Ph.D., University of Minnesota, 1974. Professor.
- LUTRIN, CARL E. (1970) ..... Political Science  
B.A., Adelphi University, 1962; M.S., University of Wisconsin, 1965; Ph.D., University of Missouri, 1971; additional graduate work, Stanford University. Professor.
- LUTRIN, P. SAMANTHA (1975) ..... Student Life and Activities  
B.A., St. Cloud State University, 1965; M.A., University of Iowa, 1969. Assistant Director Student Community Services.
- MAAS, DONALD K. (1976) ..... Education  
B.A., University of California, Los Angeles, 1966; M.Ed., State University of New York at Buffalo, 1969; Ed.D., 1971. Professor.
- MACH, GEORGE R. (1954) ..... Mathematics  
B.A., Iowa State Teachers College, 1950; M.S., State University of Iowa, 1951; Ph.D., Purdue University, 1963. Professor.
- MACIAS, RAY (1980) ..... Business Affairs  
B.A., University of Texas, 1964. Procurement and Support Services Officer.
- MADRIGAL, DORA (1984) ..... Student Academic Services  
B.A., University of California, Santa Barbara, 1976. Academic Adviser.
- MADSEN, EUGENE F. (1974) ..... Student Health Services  
B.A., University of Rochester, 1949; M.D.C.M., McGill University; Internship, Southern Pacific Hospital, San Francisco, 1957; Residency, Contra Costa County Hospital, 1958; M.P.H., University of Hawaii, 1969. Physician.
- MAKSOUDIAN, Y. LEON (1963) ..... Statistics  
B.S., California State Polytechnic College, 1957; M.S., University of Minnesota, 1961; Ph.D., University of Minnesota, 1970. Professor.
- MALKIN, MICHAEL R. (1974) ..... Theatre and Dance  
A.B., Tufts University, 1965; M.A., 1970; Ph.D., 1971. Professor.
- MALLAREDDY, H. (1981) ..... Civil and Environmental Engineering  
B.E., Mysore University, India, 1958; M.E., University of Oklahoma, 1966; Ph.D., 1968. Professor. Registered Professional Engineer, Louisiana and Indiana.
- MALMBORG, FREDRICK B. (1969) ..... Mechanical Engineering  
B.S., New York University, 1955; M.S., Columbia University, 1963. Associate Professor.
- MALONEY, KERRY A. (1983) ..... Financial Aid  
B.S., Bowling Green State University, 1980; M.A., Ohio State University, 1983. Counselor.
- MARK, WALTER R. (1972) ..... Natural Resources Management  
B.S., Utah State University, 1968; M.S., Colorado State University, 1970; Ph.D., 1972. Professor. Registered Professional Forester, California.
- MARLIER, JOHN F. (1981) ..... Chemistry  
B.S., University of Wisconsin, Stevens Point, 1972; Ph.D., University of Wisconsin, Madison, 1978. Associate Professor.
- MARTIN, W. MIKE (1985) ..... Architecture  
B.Arch., University of Colorado, 1969; M.Arch., University of Washington, 1971; Ph.D., University of California, Berkeley, 1983. Professor and Department Head. Registered Architect, Kansas. NCARB Certificate.
- MARTINEZ, ANGELINA (1966) ..... University Library  
B.A., Inter-American University, San German, Puerto Rico, 1943; B.S., Louisiana State University, 1945; M.S., University of Illinois, 1957. Assistant Director.
- MARTINEZ, EUGENE J. (1980) ..... Counseling Services  
B.A., Western State College, 1969; M.A., 1974; Ph.D., University of Colorado, 1980. Counselor.



- MARTINEZ, EVERARDO (1982) ..... Student Academic Services  
B.S., California Polytechnic State University, 1980; M.S., 1983. Outreach Coordinator.
- MASCY-RAMIREZ, CLARE (1981) ..... Financial Aid  
B.S., California Polytechnic State University, San Luis Obispo, 1981. Counselor.
- MASH, DONALD R. (1984) ..... Mechanical Engineering  
B.S., Carnegie Tech., 1945; M.S., 1950; Ph.D., Stanford University, 1953. Professor. Registered Professional Engineer, California and Oregon.
- MASON, ANTHONY K. (1980) ..... Industrial Engineering  
B.S., University of Southern California, 1959; M.S., 1963; Ph.D., 1967. Professor. Registered Professional Engineer, California.
- MAXWELL, JOHN C. (1978) ..... Chemistry  
B.S., Whitworth College, 1969; Ph.D., Colorado State University, 1979. Associate Professor.
- MAYO, EDWARD L. (1968) ..... History  
B.A., Claremont Men's College, 1959; M.A., 1966; Ph.D., Claremont Graduate School, 1969. Professor.
- McBRIDE, SUSAN L. (1979) ..... Education  
B.S., University of Akron, 1963; M.S., 1972; Ph.D., 1979. Associate Professor.
- McCALEB, DONALD L. (1962) ..... Public Affairs  
B.S., California State University, Los Angeles, 1958; M.A., California Polytechnic State University, 1970. Public Information Officer.
- McCOMBS, JOHN W. (1960) ..... Electronic and Electrical Engineering  
B.S., Clemson University, 1950; B.S., 1957; M.S., 1961; M.A., Northern Arizona University, 1971. Professor.
- McCORKLE, ROBERT E. (1962) ..... Agricultural Management  
B.S., California State Polytechnic College, 1960; M.S., University of California, 1962; additional graduate study, Oregon State University, University of Wisconsin. Professor.
- McDILL, JEAN M. (1973) ..... Mathematics  
B.S., University of Texas, 1957; M.S., University of Florida, 1968; Ph.D., 1971. Professor.
- McDONALD, LUANN A. (1983) ..... Financial Aid  
B.A., California Polytechnic State University, San Luis Obispo, 1978; M.A., 1981. Counselor.
- McDONNELL, ROBERT A. (1975) ..... English  
B.A., St. John's University, 1951; M.A., University of Minnesota, 1954; Ph.D., 1958. Professor.
- McDOUGALL, MICHAEL E. (1972) ..... City and Regional Planning  
B.Arch., University of Hong Kong, 1955; graduate study, Architectural Association School, London, 1956-57; M.C.R.P., Cornell University, 1958. Professor.
- McGARY, STEPHEN D. (1984) ..... Agricultural Management  
B.S., Brigham Young University, 1979; M.S., 1980; Ph.D., Washington State University, 1984. Associate Professor.
- McGONAGILL, WILLARD L. (1967) ..... Architecture  
B.S., Colorado University, 1955; B.Arch., 1956. Professor. Registered Architect and Licensed General Contractor, California.
- McINTIRE, ROBERT H. (1977) ..... Management  
B.S., Oklahoma State University, 1949; M.S., University of Colorado, 1960; Ph.D., University of Washington, 1968. Professor and Department Head.
- McKIBBIN, CARROLL R. (1974) ..... Political Science  
B.A., Drake University, 1959; M.A., 1960; Ph.D., University of Kansas, 1967. Professor.
- McKIM, PATRICK C. (1973) ..... Social Sciences  
B.A., University of California, Berkeley, 1967; M.A., 1970; Ph.D., 1973. Professor.
- McKINSTRY, JOHN A. (1968) ..... Social Sciences  
A.B., University of California, Los Angeles, 1961; A.M., University of Southern California, 1963; Ph.D., 1970. Professor.
- McLEOD, MALCOLM G. (1973) ..... Biological Sciences  
B.S., California Polytechnic College, Pomona, 1965; M.A., California State College, Fullerton, 1968; Ph.D., Arizona State University, 1973. Professor.
- McMORRAN, WAYNE E. (1962) ..... Electronic and Electrical Engineering  
B.S., California State Polytechnic College, 1960; M.S., New York University, 1962. Professor.
- McNEIL, ROBERT J. (1976) ..... Crop Science  
B.S., Rutgers University, 1967; M.S., 1970; Ph.D., 1975. Associate Professor.
- MEHDIZADEH, AMROLLAH (1984) ..... Mechanical Engineering  
B.S., Abadan Institute of Technology, 1978; M.S., University of Southern California, 1980; Ph.D., 1984. Assistant Professor.

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- MELLON, MAUREEN C. (1986) ..... Computer Science  
B.S., Villanova University, 1974; M.S., Drexel University, 1976; additional graduate study, University of California, Los Angeles. Associate Professor.
- MENDENHALL, JOHN P. (1980) ..... Art and Design  
B.F.A., University of Illinois, 1972; M.A., Stanford University, 1974. Professor.
- MENG, SHIEN YI (1968) ..... Electronic and Electrical Engineering  
B.S., Taiwan Provincial Cheng Kung University, 1953; M.S., Oklahoma State University, 1958; Ph.D., Ohio State University, 1968. Professor.
- MENON, UNNY (1978) ..... Industrial Engineering  
A.P., Sheffield Polytechnic, England, 1969; M.Phil., 1972; Ph.D. University of Nottingham, 1985. Professor. Registered Professional Engineer, Great Britain.
- METCALF, LYNN E. (1986) ..... Business Administration  
B.A., University of Oregon, 1978; M.I.M. American Graduate School of International Management, 1981. Associate Professor.
- MEYERS, ROBERT E., JR. (1977) ..... Physical Education and Recreation Administration  
A.B., Stanford University, 1953; M.S., San Jose State University, 1965; D. Crim., University of California, Berkeley, 1974. Professor.
- MICHAUD, WILLIAM K. (1979) ..... Agricultural Management, Computer Science  
B.S., California State Polytechnic College, 1953; M.S., 1981. Associate Professor.
- MICHELFELDER, DIANE P. (1981) ..... Philosophy  
A.B., Bryn Mawr College, 1975; Ph.D., University of Texas, 1982. Associate Professor.
- MILLER, ERNEST C. (1968) ..... Management  
B.A., University of Chicago, 1941; M.B.A., 1946; Ph.D., University of Denver, 1954. Professor.
- MILLER, HAROLD R. (1968) ..... Accounting  
B.S., University of Missouri, 1958; M.S., 1959. Associate Professor. Certified Public Accountant.
- MILLER, PAMELA COOK (1978) ..... Speech Communication  
B.A., Purdue University, 1968; M.A., 1970; Ph.D., University of Southern California, 1976. Associate Professor.
- MISIC, DRAGOSLAV M. (1970) ..... Civil and Environmental Engineering  
Diploma Engineer, University of Ljubljana, Yugoslavia, 1957; M.S., Ph.D., Northwestern University, 1963. Professor. Registered Professional Engineer, California.
- MOERMAN, KAREN SUE (1969) ..... Home Economics  
B.S., University of Georgia, 1964; M.S., 1967. Associate Professor.
- MOIR, NEIL J. (1970) ..... Chemistry  
B.S., Lewis and Clark College, 1962; M.S., University of Oregon Medical School, 1966; Ph.D., 1968; Postdoctoral Fellow, Cornell University, 1968-1970. Professor.
- MONTECALVO, JOSEPH (1983) ..... Food Science and Nutrition  
B.S., University of Rhode Island, 1972; M.S., 1975; Ph.D., 1979. Associate Professor.
- MONTGOMERY, WAYNE R. (1982) ..... University Library  
A.B., University of California, Berkeley, 1977; M.L.S., University of California, Los Angeles, 1981. Assistant Librarian.
- MOORE, CAROLE M. (1980) ..... Counseling Services  
B.A., California Polytechnic State University, 1976; M.A., 1978. Career Specialist.
- MORALES, RICHARD E. (1985) ..... Student Academic Services  
B.A., California State University, 1970; M.A., 1974. Acting Outreach Coordinator.
- MOREIRA, SIXTO EMILIO (1972) ..... Architecture  
B.S., University of Oklahoma, 1950; M.Arch., 1971; additional graduate study, University of California, Los Angeles. Professor. Registered Architect, California.
- MOREY, KRISHNAKUMAR S. (1970) ..... Food Science and Nutrition  
B.S., Nagpur University, India, 1955; M.S., 1958; M.S., U.C. Medical Center, San Francisco, 1963; Ph.D., University of California, Berkeley, 1967. Professor.
- MORGAN, ANN (1980) ..... Psychology and Human Development  
B.A., Texas Tech University, 1971; M.A., 1975; Ph.D., 1980. Associate Professor.
- MORGAN, DONALD E. (1968) ..... Industrial Engineering  
B.S., Oregon State College, 1940; M.S., Stanford University, 1962; Ph.D., 1963. Professor and Department Head. Registered Professional Engineer, California.
- MORRIS, DON M. (1957-62) (1969) ..... Education  
B.S., California State Polytechnic College, 1953; M.A., 1958; Ed.D., University of California, Los Angeles, 1968. Professor.
- MORRIS, NANCY A. (1985) ..... Home Economics  
B.S., Central Michigan University, 1973; M.S., 1978; Ph.D., Ohio State University, 1983. Assistant Professor.

- MORRIS, NANCY C. (1977) ..... Agricultural Management  
B.S., St. Louis University, 1966; M.Acct., University of Arizona, 1975. Associate Professor. Certified Public Accountant, Certified Financial Planner.
- MORRISON, KENT E. (1979) ..... Mathematics  
B.A., University of California, Santa Cruz, 1971; Ph.D., 1977. Associate Professor.
- MOSHER, LYNN S. (1974) ..... Industrial Technology  
B.S., State University College, Oswego, New York, 1963; M.Ed., St. Lawrence University, 1966; Ed.D., Utah State University, 1972. Professor.
- MOTT, W. STEPHEN (1972) ..... Graphic Communication  
B.S., California State Polytechnic College, 1959; M.A., 1973. Professor.
- MOTTELER, ZANE C. (1982) ..... Computer Science  
B.S., Stanford University, 1957; M.S., 1962; Ph.D., 1964; M.S., Michigan State University, 1981; additional graduate study, University of Minnesota, University of New Mexico. Professor.
- MOTTMANN, JOHN (1974) ..... Physics  
B.A., University of California, Los Angeles, 1966; M.A., 1967; Ph.D., 1972. Professor.
- MOUSTAFA, SAFWAT M. A., (1984) ..... Mechanical Engineering  
B.S., University of Alexandria, 1960; M.S., University of California, Davis, 1963; Ph.D., Michigan State University, 1967. Professor. Registered Professional Engineer, Illinois and Iowa.
- MUELLER, JAMES R. (1980) ..... Mathematics  
B.A., University of Wisconsin, 1975; Ph.D., California Institute of Technology, 1982. Associate Professor.
- MUELLER, WESLEY J. (1984) ..... Crop Science  
B.S., Brigham Young University, 1977; M.S., 1981, Ph.D., 1983, Utah State University. Assistant Professor.
- MUENCH, JOSEPH W. (1985) ..... Counseling Services  
B.A., California State University, Chico, 1975; M.A., 1976; Ph.D., University of California, Berkeley, 1985. Associate Test Officer.
- MULDER, GEORGE (1968) ..... Counseling Services  
B.A., Long Beach State College, 1956; M.A., 1957; Ph.D., University of Southern California, 1971. Counselor.
- MULLISEN, RONALD S. (1977) ..... Mechanical Engineering  
B.S., California State Polytechnic College, 1969; M.Engr., 1976; Ph.D., Colorado State University, 1983. Associate Professor. Registered Professional Engineer, California.
- MUNROE, PATRICK A. (1980) ..... Graphic Communication  
A.O.C.A., Ontario College of Art, 1976. Associate Professor.
- MURPHY, JAMES L. (1981) ..... Industrial Technology  
B.A., Long Beach State College, 1971; M.A., California Polytechnic State University, San Luis Obispo, 1985. Associate Professor.
- MURPHY, PAUL F. (1970) ..... Mathematics  
A.B., Catholic University of America, 1961; M.A., Brooklyn College, 1966; Ph.D., Michigan State University, 1971. Professor and Interim Department Head.
- MURRAY, GEORGE T. (1978) ..... Metallurgical Engineering  
B.S., University of Kentucky, 1949; M.S., University of Tennessee, 1951; Sc.D., Columbia University, 1958. Professor and Department Head. Registered Professional Engineer, California.
- MURRAY, RANDALL L. (1977) ..... Journalism  
B.S., Ohio University, 1960; M.S., 1961; Ph.D., University of Minnesota, 1973. Professor and Department Head.
- MYERS, LEONARD D. (1984) ..... Computer Science  
B.S., Illinois State University, 1963; M.S., 1966; Ph.D., University of Kansas, 1977. Professor.
- NAFISI, AHMAD (1983) ..... Electronic and Electrical Engineering  
B.S., Arya Mehr University of Technology, Iran, 1975; M.S., University of Southern California, 1977; Ph.D., 1983. Associate Professor.
- NAKAMURA, RAYMOND M. (1980) ..... Physical Education and Recreation Administration  
B.S., Northern Illinois University, 1965; M.S. 1967; M.S., DePaul University, 1980; Ph.D., University of Toledo, 1974. Professor.
- NAKAMURA, ROYDEN (1978) ..... Biological Sciences  
B.A., University of Hawaii, 1961; M.S., 1965; Ph.D., University of British Columbia, 1970. Associate Professor.
- NARETTO, EDWARD M. (1979) ..... Facilities Administration  
B.S., California State Polytechnic College, 1967. Director of Plant Operations.
- NASH, JAMES H. (1978) ..... Student Health Services  
B.A., Swarthmore College, 1947; M.D., Stanford University, 1953; Internship, U.S. Naval Hospital, Philadelphia; board certified American Board of Family Practice; graduate study, University of San Francisco. Director.

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- NEEL, PAUL R. (1962) ..... Architecture  
B.S., California State Polytechnic College, 1958; B.Arch., University of Southern California, 1962; M.Arch., University of Sheffield, 1969. Professor. Registered Architect, California.
- NEELANDS, JAMES G. (1957) ..... School of Science and Mathematics  
B.S., California State Polytechnic College, 1956; graduate study, University of Washington. Supervisor of Instructional Support.
- NELSON, LAWRENCE H. (1972) ..... Mechanical Engineering  
B.S., California Institute of Technology, Pasadena, 1958; M.S., University of California, Davis, 1968; Ph.D., 1972. Professor.
- NELSON, LINDEN L. (1970) ..... Psychology and Human Development  
B.A., University of Northern Iowa, 1966; Ph.D., University of California, Los Angeles, 1970. Professor.
- NELSON, RICHARD F. (1960) ..... Biological Sciences  
B.S., Brigham Young University, 1955; M.S., 1957; Ph.D., State University of Iowa, 1960. Professor.
- NEUBERT, ROD (1978) ..... University Union  
B.S., California Polytechnic State University, San Luis Obispo, 1971; M.A., 1979. Assistant Director.
- NICOVICH, RALPH R. (1978) ..... Information Systems  
B.S., California Polytechnic State University, 1975; M.S., 1983. Manager Microcomputer and Telecommunication Systems.
- NIELSEN, KEITH E. (1959) ..... Speech Communication  
B.A., Alma College, 1953; M.A., Stanford University, 1959; M.A., California State Polytechnic College, San Luis Obispo, 1966; Ph.D., Michigan State University, 1970. Professor.
- NIKU, SAEED (1983) ..... Mechanical Engineering  
B.S., Tehran Polytechnic University, 1975; M.S., Stanford University, 1976; Ph.D., University of California, Davis, 1982. Associate Professor. Registered Professional Engineer, California.
- NILES, PHILIP W.B. (1967) ..... Mechanical Engineering  
B.S., University of California, 1957; M.S., 1958; additional graduate study, University of California, Los Angeles. Professor. Registered Professional Engineer, California.
- NIU, SHIEN HWEI (1969) ..... University Library  
B.A., National Taiwan University, 1951; M.A., Bucknell University, 1957; additional graduate study, University of Wisconsin; M.A., Indiana University, 1967. Associate Librarian.
- NOBLE, WILLIAM E. (1973) ..... Ornamental Horticulture  
B.S., University of Maryland, 1964; M.S., 1969; Ph.D., University of Florida, 1974. Professor.
- NORDQUIST, RAYMOND E. (1964) ..... Architecture  
B.S., Montana State College, 1950; M.Arch., University of California, Berkeley, 1971. Professor. Registered Architect, Montana.
- NOYES, O. ROBERT (1974) ..... Food Science and Nutrition  
B.A., Norwich University, 1963; M.Ed., University of Georgia, 1970; Ph.D., 1974. Professor.
- NULMAN, DENNIS M. (1977) ..... School of Professional Studies and Education  
B.A., University of San Diego, 1970; M.Ed., 1972; Ph.D., University of Southern California, 1977. Associate Dean.
- NUTTER, DAVID E. (1974) ..... Accounting  
A.B., West Virginia University, 1954; M.B.A., Indiana University, 1958; D.B.A., University of Southern California, 1974. Professor. Certified Public Accountant.
- OCHYLSKI, MARSHALL E. (1978) ..... Ornamental Horticulture  
B.A., University of Michigan, 1970; M.L.A., 1973. Associate Professor. Registered Landscape Architect, California.
- O'CONNOR, EUGENE L. (1964) ..... Business Administration  
B.S., St. Louis University, 1957; M.S., 1963. Professor.
- OFFERMANN, GENE P. (1970) ..... Crop Science  
B.S., Southern Illinois University, 1964; M.S., 1965; Ph.D., University of California, Davis, 1970. Professor.
- O'FLAHERTY, SUSAN (1977) ..... Financial Aid  
B.A., Adelphi University, 1972; M.A., California Polytechnic State University, 1981. Assistant Director.
- O'KEEFE, TIMOTHY G. (1983) ..... Natural Resources Management  
B.S., New York State College of Forestry, 1955; M.F., 1957; M.A., Northern Arizona University, 1973; Ph.D., 1977. Associate Professor.
- OLSEN, BARTON C. (1968) ..... History  
B.A., University of Utah, 1955; M.A., 1966; Ph.D., 1968. Professor.
- O'NEIL, THOMAS D. (1973) ..... Mathematics  
B.A., San Diego State College, 1966; M.A., 1968; Ph.D., University of Wyoming, 1969. Professor.
- O'NEILL, GERTRUDIS M. (1972) ..... University Library  
B.A., Inter-American University, Puerto Rico, 1955; M.F.A., University of Cincinnati, 1962; M.L.S., Western Michigan University, 1967; additional graduate study, Art Academy of Cincinnati. Senior Assistant Librarian.

- ORTH, MICHAEL P. (1967-69) (1970) ..... English  
B.A., University of California, Santa Barbara, 1959; M.A., San Francisco State University, 1963; Ph.D., Claremont Graduate School, 1974. Professor.
- ORTIZ, L. ALEXANDER (1982) ..... Civil and Environmental Engineering  
B.S., University of Colorado, 1977; M.S., California Institute of Technology, 1978; Ph.D., 1982. Assistant Professor.
- ORTIZ, MARIA E. (1972) ..... Biological Sciences  
B.S., Southwest Texas State University, 1968; M.A., 1970; Ph.D., Texas Woman's University, 1973. Professor.
- OSBALDESTON, ROGER J. (1972) ..... Landscape Architecture  
Diploma in Architecture, School of Architecture, Nottingham, England, 1957; M.L.A., University of Pennsylvania, 1961. Associate Professor.
- O'TOOLE, FREDERICK J. (1972) ..... Philosophy  
B.A., University of California, Los Angeles, 1966; M.A., University of California, Davis, 1968; Ph.D., 1972. Associate Professor.
- OZAWA, KENNETH S. (1963) ..... Physics  
B.S., John Carroll University, 1959; M.S., 1960; Ph.D., University of Kansas, 1975. Professor.
- PADILLA, SHARON L. (1983) ..... Student Academic Services  
B.A., Stanford University, 1982; M.A., 1983. Student Development Coordinator.
- PAGE, P. LANE (1963) ..... University Library  
B.A., University of Mississippi; M.S., Louisiana State University, 1963; M.A., California Polytechnic State University, San Luis Obispo, 1984. Associate Librarian.
- PALMER, KENNETH F. (1984) ..... Education  
B.S., Iowa State University, 1964; M.S., 1969; Ph.D., 1972. Professor.
- PAPAKYRIAZIS, ARTEMIS (1982) ..... Economics  
B.A., Athens School of Political Science, 1962; M.A., University of California, Santa Barbara, 1969; Ph.D., University of California, Riverside, 1983. Associate Professor.
- PAPAKYRIAZIS, PANAGIOTIS A. (1971) ..... Economics  
B.A., Athens School of Economics and Business Science, 1964; Ph.D., University of California, San Diego, 1974. Professor and Department Head.
- PARKER, FRANCES J. (1980) ..... Home Economics  
B.S., California State College, Northridge, 1965; M.S., California State College, Long Beach, 1967; Ph.D., Ohio State University, 1969. Professor.
- PARKER, LEE R. (1974) ..... Biological Sciences  
B.S., Brigham Young University, 1966; M.S., 1968; Ph.D., Michigan State University, 1976. Professor.
- PARR, ROBERT A., III, MAJ (1985) ..... Military Science  
B.S., University of Science and Arts of Oklahoma, 1975; M.S., Webster University, St. Louis, 1981.
- PATEL, KRISHNA N. (1985) ..... Engineering Technology  
B.S., University of India, 1965; M.S., 1965; M.S., Villanova University, 1969. Associate Professor. Registered Professional Engineer, Illinois and Pennsylvania.
- PATTERSON, WILLIAM B. (1977) ..... Mechanical Engineering  
B.S., U.S. Naval Academy, 1962; M.S., Air Force Institute of Technology, 1972. Associate Professor.
- PAUL, CHARLES A. (1985) ..... Cooperative Education  
B.A., San Diego State University, 1973; M.P.A., University of Colorado, Denver, 1979. Coordinator.
- PAUTZ, ROLAND K. (1959) ..... Animal Sciences and Industry  
B.S., Oregon State College, 1957; M.S., Oregon State University, 1968. Professor.
- PECK, ROXY L. (1979) ..... Statistics  
B.A., University of California, Riverside, 1972; Ph.D., 1979. Associate Professor.
- PEDERSEN, MARY E. (1981) ..... Food Science and Nutrition  
B.A., University of California, Santa Barbara, 1973; M.S., University of California, Los Angeles, 1976; Ph.D., 1980. Professor.
- PENDSE, PRATAPSIKHA C. (1966) ..... Biological Sciences  
B.S., Bombay University, 1947; M.S., Poona University, 1951; M.S., Utah State University, 1959; Ph.D., 1965. Professor.
- PERELLO, DOMINIC B. (1954) ..... Economics  
A.B., University of California, Santa Barbara College, 1951; M.S., University of Wisconsin, 1952; additional graduate study, University of California, Los Angeles. Professor.
- PEREZ, MARINA E. (1975) ..... Student Health Services  
B.S., University of the Philippines, 1961. Nurse Practitioner.
- PERLICK, WALTER W. (1979) ..... Business Administration  
B.S., M.S., Northern Illinois University, 1965; Ph.D., Pennsylvania State University, 1973. Professor.

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- PERRYMAN, ELIZABETH K. (1972) ..... Biological Sciences  
B.S., Memphis State University, 1964; M.S., Texas Technological College, 1967; Ph.D., University of Arizona, 1972. Professor.
- PETERS, RALPH A. (1969) ..... Physics  
B.S., Georgetown University, 1949; M.S., Pennsylvania State University, 1951; Ph.D., Fordham University, 1967. Professor.
- PETERSON, JOHN D. (1981) ..... Engineering Technology  
B.S., United States Naval Academy, 1951; M.S., University of Southern California, 1957. Associate Professor. Registered Professional Engineer, California.
- PEZO-SILVA, ARMANDO A. (1973) ..... Student Academic Services  
B.S., California State Polytechnic College, 1970; M.A., 1974; M.S., 1979. Director.
- PHILBIN, B. JUDITH (1983) ..... Associated Students, Inc.  
B.S., California Polytechnic State University, 1976. ASI Information Director.
- PHILLIPS, DENNIS R. (1976) ..... Chemistry  
B.A., Whitman College, 1971; Ph.D., University of Hawaii, 1976. Professor.
- PHILLIPS, JOHN C. (1974) ..... Crop Science  
B.S., Washington State University, 1967; M.S., Colorado State University, 1969; Ph.D., Oregon State University, 1974. Professor.
- PHILLIPS, PETER K. (1968) ..... Facilities Administration  
B.S., California State Polytechnic College, 1959. Architectural Coordinator.
- PHILLIPS, WILLIAM R. (1957) ..... Architectural Engineering  
B.Arch., University of Southern California, 1952; M.Arch., University of Hawaii, 1971. Professor. Registered Architect, California.
- PIEL, DANIEL D. (1980) ..... Art and Design  
B.A., Yale University, 1951; B.F.A., Pratt Institute, 1954; M.S., 1971. Professor.
- PIEPER, JANET L. (1984) ..... Personnel and Employee Relations  
B.S., University of Nebraska, 1954; M.A., 1969; Ph.D., 1976. Director.
- PIERCE, DAVID R., JR. (1981) ..... Construction Management  
B.S., Virginia Polytechnic Institute, 1963; M.B.A., University of West Florida, 1971. Professor and Department Head.
- PIETERS, LEON W. (1982) ..... Student Health Services  
B.A., University of California, 1955; M.D., University of California, Los Angeles, 1960. Physician.
- PILLSBURY, NORMAN H. (1974) ..... Natural Resources Management  
B.S., Humboldt State College, 1968; M.S., 1972; Ph.D., Colorado State University, 1976. Professor and Interim Department Head. Registered Professional Forester, California.
- PINARD, LEO W., II (1970) ..... Social Sciences  
B.A., University of Santa Clara, 1962; M.A., University of Notre Dame, 1963; Ph.D., 1971. Professor.
- PIPER, CURTIS DEAN (1964) ..... Soil Science  
B.A., W. J. Bryan University, 1953; M.S., Michigan State University, 1959; Ph.D., 1967. Professor.
- PIPPIN, LOUIS D. (1970) ..... Education  
B.S., West Texas State College, 1952; M.Ed., 1956; Ed.D., North Texas State University, 1970. Professor.
- PIIRTO, DOUGLAS D. (1985) ..... Natural Resources Management  
B.S., University of Nevada, Reno, 1970; M.S., Colorado State University, 1971; Ph.D., University of California, Berkeley, 1977. Associate Professor. Registered Professional Forester, California.
- PLUMB, TIMOTHY R. (1981) ..... Natural Resources Management  
B.S., Oregon State University, 1954; M.S., University of California, Berkeley, 1959; Ph.D. University of California, Riverside, 1970. Associate Professor.
- PLUMMER, WILLIAM E. (1979) ..... Animal Sciences and Industry  
B.S., North Carolina State University, 1970; M.S., 1976; Ph.D., Utah State University, 1979. Associate Professor.
- POHL, JENS G. (1973) ..... Architecture  
B.Arch., University of Melbourne, Australia, 1964; M.Bldg.Sci., University of Sydney, 1967; Ph.D., 1970. Professor. Registered Architect, Australia.
- POKORNY, CORNEL K.E. (1983) ..... Computer Science  
M.S., Technical University Vienna, Austria, 1973; Tech.D., 1977. Associate Professor.
- POLING, JOHN E. (1976) ..... Physics  
B.A., University of Chicago, 1965; M.S., University of Iowa, 1969; Ph.D., 1975. Professor.
- POTTS, PHILIP L., SR. (1982) ..... Animal Sciences and Industry  
B.S.A., University of Georgia, 1972; M.S., 1974; Ph.D., 1981. Associate Professor.

- POURAGHABAGHER, A. REZA (1979) ..... Industrial Engineering  
B.S., University of Colorado, 1972; M.S., University of California, 1973; Ph.D. University of Iowa, 1977. Professor.  
Professional Engineer, California.
- PRESTON, WILLIAM L. (1980) ..... Social Sciences  
B.A., California State College, Fresno, 1971; M.A., 1973; Ph.D., University of Oregon, 1979. Associate Professor.
- PRICE, D. JOHN (1957) ..... Mechanical Engineering  
National Certificate in M.E., Dudley and Staffordshire Technical College, 1950; B.S., California State Polytechnic  
College, 1954. Associate Professor.
- PRITCHARD, EILEEN ELLEN (1973) ..... University Library  
B.A., California State College, Chico, 1961; Ph.D., University of Kansas, 1967; M.L., Kansas State Teachers  
College, 1972. Associate Librarian.
- PROCTOR, ANDREW J. (1973) ..... Physical Education and Recreation Administration  
B.S., California State Polytechnic College, 1970; M.S., 1971; Ph.D., University of Utah, 1978. Professor.
- PROCTOR, CAROLYN (1973) ..... Placement Center  
B.S., Kansas State University, 1972; M.A., California Polytechnic State University, 1975. Career Placement  
Adviser.
- PUNCHES, GERALD N. (1971) ..... Enrollment Support Services  
B.A., Western Washington State College, 1970; M.Ed., 1971; additional graduate study, University of California,  
Santa Barbara. Registrar.
- QUINLAN, CHARLES W. (1966) ..... Architecture  
B.Arch., Cornell University, 1959; M.A., University of Sheffield, 1974. Professor. Registered Architect, California.
- RADEMAKER, PIERRE (1972) ..... Art and Design  
B.A., California State College, Long Beach, 1970; M.F.A., Syracuse University, New York, 1978. Associate  
Professor.
- RAILEY, JIMMY H. (1977) ..... Physical Education and Recreation Administration  
B.S., Murray State University, 1957; M.S., Indiana University, 1959; D.P.E., 1969. Professor.
- RAMÍREZ, OSCAR M. (1984) ..... Foreign Languages  
B.A., Loyola University, 1978; M.A., University of California, Los Angeles, 1980; Ph.D., 1984. Assistant Professor.
- RAMÍREZ, RICHARD M. (1975) ..... Business Affairs  
B.B.A., New Mexico State University, 1971. Budget Officer.
- RANDAZZO, ANTHONY JAMES (1977) ..... Industrial Technology  
B.A., San Jose State College, 1965; M.A., 1968; Ph.D., Washington State University, 1976. Associate Professor.
- RATCLIFFE, RONALD V. (1963) ..... Music  
B.A., University of Washington, 1956; M.M., University of Southern California, 1958. Professor.
- RATHBUN, LARRY P. (1970) ..... School of Agriculture  
B.S., California State Polytechnic College, San Luis Obispo, 1964; M.A., 1967; Ph.D., Ohio State University, 1974.  
Professor and Associate Dean.
- RAWLINGS, DON (1980) ..... Mathematics  
B.S., Arizona State University, 1974; M.A., University of California, San Diego, 1976; Ph.D., 1978. Associate  
Professor.
- REGAN, RONALD D. (1977) ..... Ornamental Horticulture  
B.S., California State Polytechnic College, 1951; M.A., Los Angeles State College, 1959; additional graduate study,  
University of Southern California. Professor and Department Head.
- REIF, GARY D. (1967) ..... Dairy Science  
B.S., Kansas State University, 1962; M.S., University of Nebraska, 1964; Ph.D., Iowa State University, 1967.  
Professor.
- REYNOLDS, ROBERT G. (1963) ..... Art and Design  
B.P.A., Art Center College of Design, Los Angeles, 1962; M.A., California Polytechnic State College, San Luis  
Obispo, 1970. Professor and Interim Department Head.
- REYNOSO, WENDY DEMKO (1978) ..... Student Academic Services  
B.A., California Polytechnic State University, 1978; M.A., 1984. Writing Skills Coordinator.
- RICE, MARILYNN F. (1977) ..... Education  
A.B., University of California, Los Angeles, 1960; M.Ed., California State University, Northridge, 1969; Ph.D.,  
University of California, Santa Barbara, 1977. Associate Professor.
- RICE, ROBERT P. (1976) ..... Ornamental Horticulture  
B.S., University of Georgia, 1973; M.S., 1974; Ph.D. Michigan State University, 1977. Associate Professor.
- RICE, THOMAS J., JR. (1981) ..... Soil Science  
B.S., University of Wisconsin, Madison, 1974; M.S., Montana State University, 1976; Ph.D., North Carolina State  
University, 1981. Associate Professor. Certified Professional Soil Scientist.

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- RICE, WALTER E. (1964) ..... Economics  
B.A., San Francisco State College, 1960; M.A., 1963; M.A., Claremont Graduate School, 1970; Ph.D., 1973.  
Professor.
- RICHARDS, THOMAS L. (1969) ..... Biological Sciences  
B.S., California State College, Long Beach, 1964; M.A., 1966; Ph.D., University of Maine, 1969. Professor.
- RICKARD, HERMAN E. (1959-68) (1969) ..... Dairy Science  
B.S., Ohio State University, 1950; M.S., 1954; Ph.D., 1958. Professor.
- RIEDLSPERGER, MAX E. (1969) ..... History  
A.B., Wabash College, 1959; M.A., University of Michigan, 1961; Ph.D., University of Colorado, 1969. Professor  
and Department Head.
- RIENER, KENNETH D. (1983) ..... Business Administration  
B.S., University of Idaho, 1968; M.S., Purdue University, 1969; Ph.D., 1976. Professor.
- RIFE, WILLIAM C. (1977) ..... Chemistry  
B.A., North Central College, 1956; Ph.D., University of Illinois, 1960. Professor and Department Head.
- RIGGINS-PIMENTEL, RHONDA L. (1972) ..... Biological Sciences  
B.S., Austin Peay State College, 1966; M.S., Iowa State University, 1969; Ph.D., 1972. Professor.
- RIHAL, SATWANT S. (1969) ..... Architectural Engineering  
B.S., University of Delhi, India, 1961; M.S., University of Minnesota, 1964; Ph.D., University of New Mexico,  
1969. Professor. Registered Civil Engineer, California.
- RISSE, JOSEPH C. (1982) ..... Business Affairs  
B.A., Humboldt State College, 1971; M.A., 1978. Director Housing and Conference Services.
- ROACH, DAVID M. (1966) ..... Physics  
B.S., South Dakota School of Mines and Technology, 1961; M.S., 1963; Ph.D., Oregon State University, 1974.  
Professor.
- ROBISON, JOHN C. (1985) ..... Accounting  
B.A., Whittier College, 1968; M.B.A., University of California, Los Angeles, 1971; Ph.D., University of Arizona,  
1982. Professor. Certified Public Accountant.
- ROCKMAN, ILENE F. (1975) ..... University Library  
B.A., University of California, Los Angeles, 1972; M.S., University of Southern California, 1974; M.A., California  
Polytechnic State University, 1978; Ph.D., University of California, Santa Barbara, 1985. Associate Librarian.
- RODGER, JAMES A. (1976) ..... Construction Management  
B.Bldg.Cstr., University of Florida. 1970; M.S., 1977. Associate Professor. Certified General Contractor, Florida.
- ROEST, ARYAN I. (1955) ..... Biological Sciences  
B.S., University of Virginia, 1945; B.S., Oregon State College, 1948; M.S., 1949; Ph.D., 1954. Professor.
- ROGALLA, JOHN A. (1959) ..... Agricultural Management  
B.S., California State Polytechnic College, 1956; M.S., Cornell University, 1958; Ph.D., 1968. Professor.
- ROGERS, JOHN C. (1986) ..... Business Administration  
B.S., Point Park College, 1970; M.B.A., Pennsylvania State University, 1972; Ph.D., Virginia Polytechnic Institute  
and State University, 1979. Professor.
- ROGERS, JOHN M. (1970) ..... Statistics  
B.S., Marion College, 1962; M.S., Kansas State University, 1966; Ph.D., Virginia Polytechnic Institute and State  
University, 1975. Associate Professor.
- ROGERS, ROBERT L. (1974) ..... Engineering Technology  
B.S., California Maritime Academy, 1969; M.S., Stanford University, 1972. Professor. Registered Professional  
Engineer, California.
- ROGERS, ROLF E. (1975) ..... Management  
M.A., University of Washington, 1968; Ph.D., 1970. Professor.
- ROLLINGS, DAVID R. (1968) ..... English  
A.B., University of Louisville, 1948; M.A., University of Michigan, 1949; additional graduate study, University  
of Michigan. Assistant Professor.
- ROSEN, ARTHUR Z. (1953) ..... Physics  
A.B., University of California, 1941; Ph.D., 1952. Professor.
- ROSENER, DOUGLAS K. (1985) ..... Electronic and Electrical Engineering  
B.S., University of California, Davis, 1977; M.S. University of California, San Diego, 1979; Ph.D., University of  
California, Davis, 1985. Associate Professor.
- ROSENFELD, ALLEN E. (1982) ..... Agricultural Management  
B.S., Pennsylvania State University, 1969; M.S., California Polytechnic State University, 1978. Assistant Professor.
- ROSENMAN, MONA G. (1971) ..... English  
B.A., University of Michigan, 1955; M.A., Case-Western Reserve University, 1960; Ph.D., Kent State University,  
1970. Professor and Department Head.



- ROSENTHAL, BIANCA (1971) ..... Foreign Languages  
B.S., University of Washington, 1952; M.A., 1966; Ph.D., 1970. Professor.
- ROSKE, MILDRED E. (1967) ..... Home Economics  
B.A., University of California, Los Angeles, 1955; M.A., 1958; Ph.D., University of Oregon, 1975. Professor.
- RUEHR, THOMAS A. (1974) ..... Soil Science  
B.S., Ohio State University, 1966; M.S., Iowa State University, 1970; Ph.D., Colorado State University, 1976. Professor.
- RUGGLES, JOANNE BEAULE (1973) ..... Art and Design  
B.F.A., Ohio State University, 1968; M.F.A., 1970. Associate Professor.
- RUGGLES, PHILIP K. (1966-67) (1971) ..... Graphic Communication  
B.S., West Virginia Institute of Technology, 1965; M.S., South Dakota State University, 1966. Professor.
- RUSSELL, CRAIG H. (1982) ..... Music  
B.M., University of New Mexico, 1973; M.M., 1976; Ph.D., University of North Carolina, 1981. Assistant Professor.
- RUSSELL, JOHN G. (1968) ..... Music  
A.B., California State University, Fresno, 1959; M.A., California State University, Chico, 1968. Professor.
- RUTHERFORD, ROBERT T. (1974) ..... Animal Sciences and Industry  
B.S., University of California, Davis, 1970; M.S., California Polytechnic State University, 1976. Associate Professor.
- RYAN, KATHLEEN A. (1981) ..... Psychology and Human Development  
B.A., San Diego State University, 1975; M.A., Bowling Green State University, 1978; Ph.D., 1980. Associate Professor.
- RYAN, L. DIANE (1973) ..... Financial Aid  
A.B., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1976. Associate Director.
- SAAM, PATRICIA (1966) ..... Food Science and Nutrition  
B.S., College of St. Catherine, 1950; M.S., California Polytechnic State University, 1973. Professor.
- SABOL, JOSEPH E. (1972) ..... Agricultural Education  
B.S., Fresno State College, 1963; M.Ed., University of California, 1965; Ph.D., Colorado State University, 1976. Professor and Department Head.
- SABTO, JACOB C. A. (1968) ..... Electronic and Electrical Engineering  
B.E.E., Cairo University, 1948; Ingenieur Radio-ESE, Ecole Supérieure D'Electricite, Paris, 1951; E.E., Columbia University, 1959; additional graduate study, New York University. Professor.
- SAENZ, RICHARD A. (1980) ..... Physics  
A.B., University of California, Berkeley, 1972; M.S., Cornell University, 1975; Ph.D., 1977. Associate Professor.
- SALO, GLENN W. (1955) ..... Agricultural Engineering  
B.S., Montana State College, 1950; M.S., University of Idaho, 1955; additional graduate work, University of California, Davis. Professor. Registered Civil Engineer, California.
- SALTZMAN, JUDY D. (1975) ..... Philosophy  
B.A., San Jose State University, 1963; M.A., University of California, Berkeley, 1965; M.A., 1973; Ph.D., University of California, Santa Barbara, 1977; Fulbright scholar, Freie Universität, Berlin, 1970-71. Professor.
- SANCHEZ, DAVID J. (1970) ..... Education  
B.B.A., University of Texas at El Paso, 1950; graduate study, University of California, Santa Barbara. Associate Professor and Coordinator of Ethnic Studies.
- SANDERS, MARK I. (1983) ..... Student Health Services  
B.A., Grambling College, 1973; M.D., Tulane University, 1977. Physician.
- SANDERSON, JAMES D. (1967) ..... Intercollegiate Athletics  
A.B., Fresno State College, 1962; M.S., California State Polytechnic College, 1969. Coach.
- SANDLIN, DORAL R. (1969) ..... Aeronautical Engineering  
B.S., U.S. Naval Academy, 1954; M.S., Air Force Institute of Technology; Ph.D., University of Arizona, 1972. Professor.
- SAUER, JEFFREY R. (1982) ..... Housing  
B.S., Kent State University, 1981. Coordinator of Student Development Programs.
- SCHAFFNER, DAVID J. (1972) ..... Agricultural Management  
B.S., University of California, Davis, 1964; M.B.A., University of California, Berkeley, 1970; M.S., California Polytechnic State University, 1978; Ph.D., Golden Gate University, 1980. Professor.
- SCHLEICHER, HELMUT L. (1970) ..... Construction Management  
B.A., Kaiser-Friedrich Mannheim College, 1936; M.S., Technical University, Munich, 1945; Ph.D., University of Munich, 1948; additional graduate study, University of Hawaii. Professor.

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- SCHULTZ, NED W. (1976) ..... Psychology and Human Development  
B.S., Pennsylvania State University, 1973; M.A., 1975; Ph.D., Ohio State University, 1976. Associate Professor.
- SCHUMANN, THOMAS G. (1971) ..... Physics  
B.S., California Institute of Technology, 1958; M.A., University of California, Berkeley, 1960; Ph.D., 1965.  
Professor.
- SCHWARTZ, KENNETH E. (1952) ..... Architecture  
B.Arch., University of Southern California, 1952; graduate study, Pennsylvania State University, Rensselaer  
Polytechnic Institute, University of Manchester, England. Professor. FAIA.
- SCOTT, JACK F. (1967) ..... Agricultural Management  
B.S., California State Polytechnic College, 1961; M.A., 1967. Professor.
- SCOTT, PAULA ROSEMARY (1973) ..... University Library  
B.A., University of California, Los Angeles, 1965; M.L.S., 1966; M.A., Monterey Institute of Foreign Studies, 1974.  
Associate Librarian.
- SCOTTO, KENNETH C. (1970) ..... Animal Sciences and Industry  
B.S., California State Polytechnic College, San Luis Obispo, 1966; M.S., University of Nevada, 1969. Associate  
Professor.
- SCRIVEN, TALMAGE ERNEST (1980) ..... Philosophy  
B.A., University of South Florida, 1976; M.A., 1977; Ph.D., University of Southern California, 1980. Associate  
Professor and Interim Department Head.
- SEDLITZKY, MARCEL E. (1972) ..... Architecture  
Candidate of Architecture Technical University, Graz, Austria, 1949; B.S., University of Cincinnati, 1952;  
M.Arch., University of California, Berkeley, 1973. Professor. Registered Architect, California.
- SEIFODDINI, AHMAD K. (1984) ..... Industrial Engineering  
B.S., Abadiah Institute of Technology, 1965; M.S., Oklahoma State University, 1973; Ph.D., 1976. Associate  
Professor.
- SEIM, EDWIN C. (1978) ..... Crop Science  
B.S., University of Missouri, 1954; M.S., University of Minnesota, 1966; Ph.D., 1970. Associate Professor.
- SENNETT, ROBERT EARL (1970) ..... Civil and Environmental Engineering  
B.S., University of Pennsylvania, 1959; M.S., 1961; Ph.D., 1963. Professor. Registered Professional Engineer,  
California.
- SETTLE, ALLEN K. (1970) ..... Political Science  
B.A., University of California, Santa Barbara, 1966; M.A., 1967; Ph.D., 1970. Professor.
- SHAFFER, RICHARD A. (1974) ..... Social Sciences  
B.A., Stanislaus State College, 1971; M.A., University of Notre Dame, 1974; Ph.D., 1975. Professor.
- SHAH, RAMESH T. (1969) ..... Mechanical Engineering  
B.E., Maharaja Sayajirao University of Baroda, India; Dr. Ing., Hochschule Fur Schwermaschinenbau, Mag-  
deburg, East Germany, 1959. Professor. Registered Professional Engineer, California.
- SHANI, ABRAHAM B. (1983) ..... Management  
B.A., University of Tel Aviv, 1972; M.A., 1978; Ph.D., Case Western Reserve University, 1981. Associate Profes-  
sor.
- SHANK, CAROLYN B. (1974) ..... Physical Education and Recreation Administration  
B.S., California State Polytechnic College, 1969; M.S., 1975; Ed.D., University of Utah, 1981. Associate Professor.
- SHARP, HARRY, JR. (1975) ..... Speech Communication  
A.B., College of the Pacific, 1959; M.S., Purdue University, 1961; Ph.D., 1967. Professor and Department Head.
- SHEIK, HABIB (1967) ..... English  
B.S., California State University, Fresno, 1959; A.B., 1960; M.A., California State Polytechnic College, 1961; M.A.,  
University of California, Los Angeles, 1966; Ph.D., University of Nebraska, 1979. Associate Professor.
- SHELTON, MARK D. (1982) ..... Crop Science  
B.S., University of Idaho, 1977; M.S., Purdue University, 1980. Assistant Professor.
- SHIERS, ALDEN F. (1975) ..... Economics  
B.S., University of Maine, 1967; Ph.D., University of California, Santa Barbara, 1977. Associate Professor.
- SHOCKLEY, STEVEN B. (1985) ..... Alumni Relations  
B.S., University of Alabama, 1971. Director.
- SILVER, GORDON A. (1964) ..... Physics  
B.S., University of California, Los Angeles, 1959; M.S., 1961; additional study, University of California, Berkeley.  
Professor.
- SILVERS, ARTHUR H. (1976) ..... Architecture  
B.Arch., University of Southern California, 1959; M.A., California Polytechnic State University, San Luis Obispo,  
1978. Professor. Registered Architect, California.

- SILVESTRI, MICHAEL G. (1978) ..... Chemistry  
B.S., University of California, Santa Barbara, 1973; Ph.D., University of California, Santa Cruz, 1977. Associate Professor.
- SIMEK, JAN. W. (1977) ..... Chemistry  
B.A., Kalamazoo College, 1970; M.S., Stanford University, 1971; Ph.D., 1975. Associate Professor.
- SIMMONS, JAMES E. (1966) ..... English  
B.A., University of California, Santa Barbara, 1959; M.A., University of Wisconsin, 1960; Ph.D., 1966. Professor.
- SLACK, DARLENE L. (1983) ..... University Relations  
B.A., California State College, Northridge, 1969. Associate Director.
- SLEM, CHARLES M. (1975) ..... Psychology and Human Development  
B.A., University of California, Los Angeles, 1968; M.A., 1972; Ph.D., Wayne State University, 1975. Professor.
- SMELAND, CHRISTIAN O. (1982) ..... Intercollegiate Athletics  
B.A., California Polytechnic State University, San Luis Obispo, 1974; M.A., University of Colorado, 1976. Coach.
- SMIDT, ROBERT K. (1978) ..... Statistics  
B.S., Manhattan College, 1971; M.S., Rutgers University, 1973; Ph.D., University of Wyoming, 1976. Professor.
- SMITH, DALE A. (1973) ..... Animal Sciences and Industry  
B.S., University of California, Davis, 1971; D.V.M., 1973. Professor.
- SMITH, DOUGLAS B. (1977) ..... English  
B.A., Johns Hopkins University, 1969; M.A., Fairfield University, 1975; Ph.D., Rensselaer Polytechnic Institute, 1979. Associate Professor.
- SMITH, GERALD L. (1980) ..... Landscape Architecture  
B.S., Iowa State University, 1961; M.L.A., University of Illinois, 1968. Professor and Department Head.
- SMITH, KENT D. (1981) ..... Statistics  
B.A., University of Utah, 1967; M.S., Air Force Institute of Technology, 1969; M.S., University of California, Riverside, 1979; Ph.D., 1981. Associate Professor.
- SMITH, NELSON L., III (1962) ..... Industrial Technology  
B.S., Lowell Technological Institute, 1960; M.S., 1962; additional graduate study, University of Iowa. Professor.
- SMITH, STANLEY B. (1978) ..... Business Administration  
B.S., University of Utah, 1953; M.B.A., 1962; D.B.A., University of Southern California, 1978. Professor.
- SMITH, TERRY L. (1980) ..... Soil Science  
B.S., University of Nebraska, Lincoln, 1972; M.S., 1975; Ph.D., Iowa State University, 1980. Associate Professor.
- SNETSINGER, JOHN G. (1970) ..... History  
A.B., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1966; Ph.D., Stanford University, 1969; additional graduate study, Stanford School of Law. Professor.
- SNODGRASS, MARCI (1984) ..... Student Life and Activities  
B.A., University of California, Berkeley, 1976; M.A., Oregon State University, 1979. Coordinator Recreational Sports.
- SNYDER, DAVID H. (1970) ..... Enrollment Support Services  
B.A., California Polytechnic State University, San Luis Obispo, 1973; M.A., 1975. Admissions Officer.
- SOMAYAGI, SHAN (1979) ..... Civil and Environmental Engineering  
B.E., University of Mysore, 1968; M.Tech., 1974; M.S., South Dakota School of Mines and Technology, 1975; Ph.D., University of Illinois, Chicago, 1979. Associate Professor. Registered Professional Engineer, California.
- SOMPPI, SUSAN (1978) ..... Student Academic Services  
B.S., University of Texas, 1970; M.A., California Polytechnic State University, San Luis Obispo, 1978. Academic Adviser.
- SORENSEN, DARYL F. (1984) ..... Extended Education  
B.A., Occidental College, 1958; M.A., Fresno State College, 1964; Ed.D., University of the Pacific, 1973. Associate Director.
- SPARLING, SHIRLEY R. (1963) ..... Biological Sciences  
B.S., Iowa State College, 1950; M.S., 1951; Ph.D., University of California, 1956. Professor.
- STAHL, VERLAN H. (1968) ..... Foreign Languages  
B.A., College of the Pacific, 1950; M.A., Florida State University, 1955; Ph.D., University of Madrid, 1969. Professor.
- STALLARD, MARY L. (1965) ..... Physical Education and Recreation Administration  
B.A., Fresno State College, 1957; M.S., University of Washington, 1965; Ph.D., University of Utah, 1974. Professor.
- STANHOPE, TERRY (1981) ..... Electronic and Electrical Engineering  
B.S., California State Polytechnic College, 1968; M.S., University of Southern California, 1976. Associate Professor.

- STANSFIELD, WILLIAM D. (1963) ..... Biological Sciences  
B.S., California State Polytechnic College, 1953; M.A., 1959; M.S., University of California, Davis, 1962; Ph.D., 1963. Professor.
- STANTON, GEORGE C. (1981) ..... Counseling Services  
B.A., Lake Forest College, 1963; M.A., Cornell University, 1968; Ph.D., Stanford University, 1980. Test Officer.
- STARKEY, EUGENE E. (1978) ..... Dairy Science  
B.S., California State Polytechnic College, 1952; M.S., University of Wisconsin, 1954; Ph.D., 1958. Professor and Department Head.
- STAYTON, LAWRENCE W., MAJ (1985) ..... Military Science  
B.S., Loyola University, Chicago, 1970.
- STEARNS, JOSEPHINE S. (1969) ..... Psychology and Human Development  
B.A., University of New Hampshire, 1958; M.A., Michigan State University, 1969; Ph.D., Texas Woman's University, 1982. Professor.
- STEBBINS, MICHAEL W. (1982) ..... Management  
B.S., University of California, Berkeley, 1967; M.B.A., 1968; Ph.D., 1973. Associate Professor.
- STECHEMAN, JOHN V. (1960) ..... Animal Sciences and Industry  
B.S., University of California, Davis, 1957; M.S., 1960. Professor.
- STEINBERG, HOWARD (1970) ..... Mathematics  
B.M.E., City College of New York, 1950; M.S., New York University Graduate School, 1966; Ph.D., 1969. Professor.
- STEWART, PATRICIA A. (1971) ..... Learning Assistance Center  
B.S., California State Polytechnic College, 1970; M.A., California Polytechnic State University, 1972. Coordinator.
- STIPICEVICH, JOHN (1985) ..... University Union  
B.A., San Jose State University, 1985. Reservation Information Supervisor.
- STOFFEL, EDWARD O. (1957) ..... Mechanical Engineering  
B.M.E., University of Santa Clara, 1950; Mech.Engr., 1955; M.S., Oregon State University, 1968. Professor. Registered Professional Engineer, California.
- STOWE, KEITH S. (1971) ..... Physics  
B.S., Illinois Institute of Technology, 1965; M.S., University of California, San Diego, 1967; Ph.D., 1971. Professor.
- STRAHL, RICHARD A. (1985) ..... Engineering Technology  
B.S., Michigan Technological University, 1966; M.S., 1969. Associate Professor. Registered Professional Engineer, Ohio.
- STRICKMEIER, H. BERNARD (1970) ..... Mathematics  
B.S., Texas Lutheran College, 1962; M.A., University of Texas, 1967; Ph.D., 1970. Professor.
- STROHMAN, ROLLIN D. (1969) ..... Agricultural Engineering  
B.S., University of Illinois, 1962; M.S., 1965; Ph.D., Purdue University, 1969. Professor.
- STROM, JAMES L. (1984) ..... University Relations  
B.S., Clemson University, 1956; B.A., Augusta College, Georgia, 1970; Ph.D., Clemson University, 1975. Vice President.
- STRONG, CHARLES W. (1971) ..... English  
B.S., Arizona State University, 1965; M.A., University of Missouri, 1969. Associate Professor.
- STUBBS, DANIEL F. (1963-66) (1968) ..... Computer Science  
B.S., Purdue University, 1960; M.S., Rensselaer Polytechnic Institute, 1962; Ph.D., 1973. Professor.
- STULTZ, W. FRED (1977) ..... Psychology and Human Development  
B.A., University of Southern Colorado, 1970; M.S., Purdue University, 1973; Ph.D., 1974. Associate Professor.
- SUCHAND, GEORGE J. (1971) ..... Social Sciences  
B.A., Louisiana State University, 1958; M.A., University of Florida, 1967; Ph.D., University of Oklahoma, 1972; M.S., California Polytechnic State University, 1978. Professor.
- SUESS, MICHAEL H. (1975) ..... Personnel and Employee Relations  
B.S., California Polytechnic State College, San Luis Obispo, 1970; M.S., 1971; additional graduate study, Brigham Young University. Associate Director.
- SUHR, MOON JA MINN (1969-71) (1972) ..... Theatre and Dance  
B.S., Ewha Women's University, Seoul Korea, 1963; M.A., Colorado State College, 1969; additional graduate study, Texas Women's University. Professor.
- SULLIVAN, GERALD J. (1968) ..... English  
B.A., University of Wichita, 1957; M.A., University of Oklahoma, 1959; Ph.D., 1964. Professor.
- SUTLIFF, DALE A. (1973) ..... Landscape Architecture  
B.S., California State Polytechnic College, Pomona, 1965; M.R.P., University of Pennsylvania, 1973. Professor.

- SWANSEN, VERN (1971) ..... Architecture  
B.Arch., University of Southern California, 1939; M.Arch., University of Strathclyde, 1975. Professor.
- SWANSON, BESSIE R. (1977) ..... School of Liberal Arts  
A.B., B.Mus., University of the Pacific, 1943; M.A., 1952; D.M.A., Stanford University, 1967. Professor and Associate Dean.
- SWANSON, CLIFTON E. (1967) ..... Music  
B.A., Pomona College, 1963; M.M., University of Texas, 1965; additional graduate study, University of California. Professor and Department Head.
- SWANSON, ROGER M. (1984) ..... Enrollment Support Services  
B.A., North Central College, 1963; M.A., University of Illinois, Urbana, 1964; Ph.D., 1968. Associate Provost.
- SWEARINGEN, DON E. (1974) ..... Architecture  
B.Arch., Oklahoma State University, 1968; M.Arch., University of Illinois, 1972. Associate Professor.
- SWIDERSKI, MICHAEL (1983) ..... Physical Education and Recreation Administration  
B.S., University of Southern California, 1972; M.A., 1974; Ph.D., University of Oregon, 1981. Assistant Professor.
- SYDNOR, WILLIAM E. (1981) ..... Learning Assistance Center  
B.A., Whittier College, 1971; M.A., University of California, Riverside, 1974. Counselor.
- TAKKEN, MEREDITH R. (1976) ..... Financial Aid  
B.A., California State College, Chico, 1971. Pell Grant Manager.
- TALBOTT, LAURENCE F. (1966) ..... Industrial Technology  
A.B., San Diego State University, 1951; M.B.A., University of Southern California, 1965; Ed.D., Utah State University, 1972; M.Engr., California Polytechnic State University, 1979; additional graduate study, Exeter College, University of Oxford. Professor and Department Head. Registered Professional Engineer, California; Certified Plant Engineer.
- TANDON, SHYAMA (1983) ..... Electronic and Electrical Engineering  
B.S., Banaras University, India, 1965; M.S., University of Iowa, 1971; Ph.D., Texas A & M, 1976. Associate Professor.
- TARTAGLIA, RICHARD A. (1959) ..... Facilities Administration  
B.S., California State Polytechnic College, 1957. Associate Director of Plant Operations.
- TASKEY, RONALD D. (1977) ..... Soil Science  
B.S., University of Montana, 1970; M.S., 1972; Ph.D., Oregon State University, 1978. Associate Professor.
- TAYLOR, QUINTARD, JR. (1977) ..... History  
B.A., Saint Augustine's College, 1969; M.A., University of Minnesota, 1971; Ph.D., 1977. Associate Professor.
- TELLEW, FUAD H. (1960) ..... Economics  
B.S., College of Commerce and Economics, Baghdad, Iraq, 1950; M.A., University of Southern California, 1954; Ph.D., 1959; post-doctoral research, University of California, Berkeley, 1967-1968. Professor.
- TERRY, RAYMOND D. (1974) ..... Mathematics  
B.S., State University of New York, 1966; M.S., Michigan State University, 1968; Ph.D., 1972. Professor.
- THIES, EMIL A. (1984) ..... Management  
B.A., William Jewel College, 1969; M.B.A., University of Missouri, Columbia, 1978; Ph.D., 1984. Associate Professor.
- THOMAS, GUY H., JR. (1968) ..... Graphic Communication  
B.S., California State Polytechnic College, 1953; M.A., 1971. Professor.
- THOMAS, JOHN W. (1968) ..... Biological Sciences  
B.A., Los Angeles State College, 1957; Ph.D., University of Southern California, Los Angeles, 1968. Professor.
- THOMPSON, ROBERT C. (1981) ..... Agricultural Management  
B.S., California State Polytechnic College, 1969; M.S., University of California, Davis, 1970. Associate Professor.
- THURMOND, WILLIAM (1951) ..... Biological Sciences  
A.B., University of California, 1948; M.A., 1950; Ph.D., 1957. Professor.
- TICE, RUSSELL L. (1965) ..... Chemistry  
B.S., Marshall University, 1960; Ph.D., University of California, Los Angeles, 1965. Professor.
- TIMONE, BARNEY R. (1969) ..... Alumni Relations  
B.A., Chico State College, 1965; M.A. Idaho State University, 1969. Assistant Director.
- TOWNSEND, NEAL R. (1965) ..... Mathematics  
B.S., Wisconsin State College, 1953; M.A., San Diego State College, 1961; Ph.D., Purdue University, 1972. Professor.
- TREVIÇO, GLORIA VELÁSQUEZ (1985) ..... Foreign Languages  
B.A., University of Northern Colorado, 1978; M.A., Stanford University, 1980; Ph.D., 1985. Assistant Professor.
- TROY, BERNARD A. (1970) ..... Education  
B.A., University of Notre Dame, 1957; S.T.L., Universidad Catolica de Chile, 1961; M.A., University of Notre Dame, 1965; Ph.D., University of Southern California, 1974; Fulbright Fellow, Ministry of Education, Montevideo, Uruguay. Professor.

## 642 Faculty and Staff

- TRUEX, JOSEPH W. (1954) ..... Graphic Communication  
B.S., California State Polytechnic College, 1952; M.S., South Dakota State University, 1966. Professor.
- TRYON, BETTE W. (1976) ..... Psychology and Human Development  
B.S., University of Maryland, 1966; M.S., 1973; Ph.D., Syracuse University, 1976. Professor.
- TRYON, WALTER M. (1976) ..... Landscape Architecture  
B.S., Syracuse University, 1964; M.L.A., 1974. Associate Professor.
- TSENG, JAMES H. W. (1969) ..... Electronic and Electrical Engineering  
LL.B., National Taiwan University, 1950; LL.M., Southern Methodist University, 1957; B.S., Illinois Institute of Technology, 1964; M.S., 1966; Ph.D., Southern Methodist University, 1978. Professor. Registered Professional Engineer, Texas.
- TURLEY, LOUIS W. (1986) ..... Business Administration  
B.S., Murray State University, 1975; M.B.A., 1979. Associate Professor.
- ULLERICH, STANTON G. (1984) ..... Agricultural Management  
B.A., Buena Vista College, 1982; M.S., Iowa State University, 1984. Assistant Professor.
- VANCE, ROBERT D. (1972) ..... Food Science and Nutrition  
B.S., Brigham Young University, 1966; M.S., Ohio State University, 1968; Ph.D., 1971. Professor and Department Head.
- VAN De VANTER, GORDON L. (1960-66) (1968) ..... Crop Science  
B.S., California State Polytechnic College, 1953; M.A., 1965; additional graduate study, University of California, Davis. Professor.
- VAN EPS, JOHN (1974) ..... Mathematics  
B.A., University of California, Berkeley, 1965; Ph.D., 1969. Associate Professor.
- VAN WYNGAARDEN, WILLEM L. (1965) ..... Physics  
B.S., McMaster University, 1961; M.S., University of Manitoba, 1964; Ph.D., Louisiana State University and A & M College, 1975. Professor.
- VIGIL, SAMUEL A. (1982) ..... Civil and Environmental Engineering  
B.S., University of California, Berkeley, 1969; M.S., Texas A & M University, 1974; Ph.D., University of California, Davis, 1981. Associate Professor. Registered Professional Engineer, California.
- VILKITIS, JAMES R. (1980) ..... Natural Resources Management  
B.S., Michigan State University, 1965; M.S., University of Idaho, 1968; Ph.D., University of Massachusetts, 1970; additional graduate study 1973-74. Associate Professor.
- VIX, MARLIN DALE (1977) ..... Agricultural Management  
B.S., San Jose State University, 1968; M.S., California Polytechnic State University, 1977. Assistant Professor.
- VOLLMER, HOWARD M. (1982) ..... Extended Education  
B.A., Stanford University, 1950; M.A., 1951; Ph.D., University of California, Berkeley, 1959.
- VOSS, LARRY R. (1968) ..... University Relations  
B.A., Sacramento State College, 1956; graduate study, Sacramento State College, California State College at Los Angeles. Associate Vice President.
- WADDELL, JOSEPH JAMES (1976) ..... University Library  
B.A., California State College at San Bernardino, 1972; M.L.S. University of California, Los Angeles, 1975. Senior Assistant Librarian.
- WADLINGTON, FAYE (1973) ..... Student Health Services  
R.N., Wichita St. Joseph School of Nursing, Kansas, 1947; additional study, Los Angeles City College, University of California, Los Angeles. Nurse Practitioner.
- WALCH, DAVID B. (1980) ..... Information Systems  
B.A., Eastern Oregon College, 1958; M.L.S., University of Illinois, 1962; Ph.D., University of Utah, 1973. Interim Associate Provost.
- WALKER, HOWARD D. (1957) ..... Chemistry  
B.A., New York University, 1947; M.S., 1948; Ph.D., University of California, Los Angeles, 1955. Professor.
- WALKER, KENDRICK W. (1973) ..... Intercollegiate Athletics  
B.A., University of Southern California, 1965; M.A. 1969; Ph.D., 1974. Associate Professor and Interim Director.
- WALKER, ROBERT E. (1983) ..... Agricultural Engineering  
B.S., California State Polytechnic College, 1968; M.S., Utah State University, 1978. Associate Professor. Registered Professional Engineer, Colorado.
- WALL, LEONARD W. (1969) ..... Physics  
B.S., Louisiana Polytechnic Institute, 1963; Ph.D., Iowa State University, 1969. Professor and Department Chair.
- WALL, MATTHIAS R. (1976) ..... Construction Management  
B.S., University of Wisconsin, 1962; M.B.A., 1972; Ph.D., Texas A & M, 1976. Professor.

- WALLACE, WILLIAM CARL (1970) ..... Student Affairs  
B.S., California State Polytechnic College, San Luis Obispo, 1967; M.A., 1973; additional graduate study, University of California, Santa Barbara. Associate Dean.
- WALLER, JULIA R. (1983) ..... Financial Aid  
B.A., California State University, Sacramento, 1982. Counselor.
- WALSH, DANIEL W. (1986) ..... Metallurgical Engineering  
B.S., Rensselaer Polytechnic Institute, 1973; M.S., 1976; Ph.D., 1985. Associate Professor.
- WALTER, VIRGINIA R. (1974) ..... Ornamental Horticulture  
B.S., Ohio State University, 1970; M.S., 1972. Associate Professor.
- WALTERS, DIRK R. (1969) ..... Biological Sciences  
B.S., Western Illinois University, 1965; M.A., Indiana University, 1966; Ph.D., 1969. Professor.
- WALTERS, KENNETH D. (1983) ..... School of Business  
B.A., Walla Walla College, 1963; J.D., Stanford Law School, 1966; Ph.D., University of California, Berkeley, 1972. Professor and Dean.
- WALTERS, ROBERT W. (1970) ..... Student Life and Activities  
B.A., California State College, Fullerton, 1962; M.A., California Polytechnic State College, 1971. Coordinator New Student Orientation.
- WANG, MARY Y. (1973) ..... Food Science and Nutrition  
B.S., California State Polytechnic College, 1969; M.S., University of California, Davis, 1972; Ph.D., 1984. Professor.
- WARD, EDWARD JOHN (1970) ..... City and Regional Planning  
B.S., University of Massachusetts, 1962; M.U.P., Michigan State University, 1964; Ph.D., Claremont Graduate School, 1983. Professor.
- WARFIELD, DAVID L. (1975) ..... Crop Science  
B.S., University of California, Davis, 1966; M.S., 1968; Ph.D., Washington State University, 1973. Associate Professor.
- WARREN, RICHARD L. (1981) ..... Education  
B.A., Harvard University, 1947; M.A., Peabody College for Teachers, 1950; Ph.D., Stanford University, 1966. Professor and Department Head.
- WARTEN, RALPH M. (1968) ..... Mathematics  
B.S., Brooklyn College, 1957; M.S., Purdue University, 1959; Ph.D., 1961. Professor.
- WASSEL, GUSTAV N. (1980) ..... Electronic and Electrical Engineering  
B.S., California Institute of Technology, 1960; M.S., 1962; Ph.D., University of California, Irvine, 1972. Professor.
- WATERBURY, ARCHIE M. (1973) ..... Biological Sciences  
A.B., San Jose State College, 1966; M.A., 1968; Ph.D., University of California, Davis, 1972. Professor.
- WEATHERBY, JOSEPH N., JR. (1968) ..... Political Science  
B.A., Baylor University, 1958; B.F.T., American Institute for Foreign Trade, 1961; M.A., Baylor University, 1962; Ph.D., University of Utah, 1968; additional graduate study, Baldwin Wallace College, Ohio; Hamline University, Minnesota; American University, Cairo; Cambridge University. Professor.
- WEATHERFORD, ALAN M. (1986) ..... Business Administration  
B.A., Louisiana State University, 1969; A.D., Northwestern State University, 1977; M.B.A., University of Dallas, 1981; Ph.D., The University of Texas, Dallas, 1985. Associate Professor.
- WEBB, JAMES L. (1969) ..... Physical Education and Recreation Administration  
B.S., University of North Dakota, 1962; M.S., 1963; Ph.D., University of Oregon, 1969. Professor.
- WEBER, BARBARA P. (1966) ..... Home Economics  
B.S., University of Nevada, 1951; M.A., California Polytechnic State University, 1968; additional graduate study, University of Nevada, California Polytechnic State University, Oregon State University. Associate Professor and Department Head.
- WEBRE, NEIL W. (1969) ..... Computer Science  
B.S., Louisiana State University, 1960; A.M., Harvard University, 1968; additional graduate study, Columbia University, University of Munich. Professor and Interim Department Head.
- WEBSTER, JAMES P., JR. (1964) ..... Agricultural Engineering  
B.S., California State Polytechnic College, 1953; M.S., California Polytechnic State University, 1980. Professor.
- WEINSTEIN, STEPHEN T. (1969) ..... Mathematics  
B.A., University of Southern California, 1960; M.A., 1965; Ph.D., 1972. Professor.
- WENZL, MICHAEL J. (1969) ..... English  
B.A., University of Oregon, 1961; M.A., 1965; Ph.D., University of New Mexico, 1969; postdoctoral study, University of California, Berkeley. Professor.

- WESSELS, HENRY (1970) ..... Art and Design  
B.S., Northern Illinois University, 1957; M.F.A., University of Southern California, 1970. Associate Professor.
- WEST, HOWARD (1959) ..... Office of the President  
B.A., Pepperdine College, 1956; M.A., California State Polytechnic College, 1971. Associate Executive Vice President.
- WEST, JOHN W. (1968) ..... School of Agriculture; Animal Sciences and Industry  
B.S., University of Tennessee, 1947; M.S., 1948; Ph.D., Purdue University, 1951. Professor and Associate Dean.
- WESTOVER, JAMES D. (1971) ..... Chemistry  
B.S., Arizona State College, 1960; M.S., 1962; Ph.D., Brigham Young University, 1966. Professor.
- WHALEY, GLENN V. (1963) ..... University Library  
B.A., Carroll College, 1949; M.L.S., University of Wisconsin, 1953; M.A., Drake University, 1965. Associate Librarian.
- WHALEY, RUSSELL G. (1982) ..... Theatre and Dance  
B.A., Emerson College, 1950; graduate study, Yale University. Professor.
- WHALLS, MARVIN J. (1968) ..... Natural Resources Management  
B.S., Michigan State University, 1951; M.S., University of Michigan, 1957; Ph.D., 1970. Professor.
- WHEATLEY, JO ANN C. (1980) ..... Crop Science  
B.A., Southeastern Louisiana University, 1961; M.S., California Polytechnic State University, 1978; additional graduate study, Louisiana State University. Associate Professor.
- WHEATLEY, PATRICK O. (1970) ..... Computer Science  
B.A., St. Mary's Seminary, 1956; M.S., University of Chicago, 1963; Ph.D., University of Houston, 1970. Professor.
- WHEELER, ERNEST J., JR. (1969) ..... Intercollegiate Athletics  
B.A., University of Washington, 1961; M.S., University of Southern California, 1966. Coach.
- WHEELER, MARYLINDA (1975) ..... Physical Education and Recreation Administration  
B.A., Stanford University, 1958; M.A., 1959; Ph.D., University of Utah, 1979. Professor.
- WHEELER, ROBERT R. (1961) ..... Animal Sciences and Industry  
B.S., Colorado State University, 1952; M.S., 1955; Ph.D., Oregon State University, 1962. Professor.
- WIGHT, HEWITT G. (1952) ..... Chemistry  
B.S., University of Utah, 1943; Ph.D., University of California, 1955. Professor.
- WILK, EDWARD A. (1966) ..... University Library  
B.A., Western Michigan University, 1965; M.S.L., 1966. Associate Librarian.
- WILKINS, SMILEY E. (1974) ..... Office of the President  
B.S., Winston Salem State University, 1951; graduate study, University of Southern California, University of Utah, California Polytechnic State University. Affirmative Action Coordinator.
- WILLIAMS, BRIAN K. (1985) ..... University Library  
B.A., San Diego State College, 1969; M.L.S., San Jose State University, 1977. Senior Assistant Librarian.
- WILLIAMS, DOUGLAS W. (1983) ..... Agricultural Engineering  
B.S., Kansas State University, 1967; M.S., Iowa State University, 1969; Ph.D., University of California, Davis, 1973. Associate Professor. Registered Mechanical Engineer, California.
- WILLIAMS, GRAYDON J. (1970) ..... Music  
B.M., New England Conservatory of Music, 1957; M.M., 1959; additional study, Eastman School of Music, Peabody Conservatory of Music. Associate Professor.
- WILLIAMSON, DANIEL P. (1970) ..... Economics  
B.A., University of California, Santa Barbara, 1966; Ph.D., University of California, San Diego, 1973. Professor.
- WILLIAMSON, DAVID G. (1968) ..... Chemistry  
B.A., University of Colorado, 1963; Ph.D., University of California, Los Angeles, 1966; postdoctoral fellow, National Research Council of Canada. Professor.
- WILLS, MAX THOMAS (1967) ..... Chemistry  
B.S., University of Puget Sound, 1961; Ph.D., University of Washington, 1965. Professor.
- WILSON, JACK D. (1976) ..... Mechanical Engineering  
B.S., Michigan State University, 1956; M.S., 1958; Ph.D., 1968. Professor. Registered Professional Engineer, California and Georgia.
- WILSON, KERRY A. (1983) ..... Financial Aid  
B.S., Bowling Green State University, 1980; M.A., Ohio State University, 1983. Counselor.
- WILSON, MALCOLM W. (1968) ..... Office of the President  
B.A., Western State College, 1962; M.A., 1964; Ed.D., University of Arizona, 1973. Interim Director of Institutional Studies.
- WILSON, WALTER D. (1969) ..... Physics  
B.S., University of California, Berkeley, 1957; Ph.D., 1966. Professor.



- WILTON, MICHAEL S. (1978) ..... Intercollegiate Athletics  
B.S., Brigham Young University, Hawaii, 1972; M.S., Brigham Young University, Utah, 1977. Coach.
- WILVERT, CALVIN H. (1973) ..... Social Sciences  
B.A., University of California, Los Angeles, 1963; M.A., University of California, Berkeley, 1967; Ph.D., 1971. Professor.
- WINEBRENNER, TERRENCE C. (1983) ..... Speech Communication  
B.S., Southwest Missouri State University, 1971; M.A., 1972; Ph.D., Ohio State University, 1985. Assistant Professor.
- WINGER, DONLEY J. (1963) ..... Electronic and Electrical Engineering  
B.S., University of North Dakota, 1960; M.S., 1963; Ph.D., Iowa State University, 1971. Professor.
- WITHERS, JAMES (1979) ..... Architectural Engineering  
B.S., University of Denver, 1949; M.S., University of Illinois, 1952; Ph.D., 1964. Professor.
- WOLF, LAWRENCE J. (1970) ..... Financial Aid  
B.A., University of Southern California, 1957; LL.B., La Salle University, 1967; M.A., California Polytechnic State University, San Luis Obispo, 1973. Director.
- WOLF, ROBERT S. (1975) ..... Mathematics  
B.S., Massachusetts Institute of Technology, 1966; M.S., Stanford University, 1967; Ph.D., 1974. Professor.
- WOLFF, PAUL (1971) ..... Architecture  
B.Arch., University of California, Berkeley; graduate study, Academy of Art and Architecture, Munich, Germany; M.S., Environmental Psychology, University of Surrey, England, 1975. Professor. Registered Architect, California.
- WOLLMAN, MICHAEL (1982) ..... Electronic and Electrical Engineering  
B.E.E., Cornell University, 1964; M.S., University of Hawaii, 1966; Ph.D., University of California, Santa Barbara, 1975. Associate Professor.
- WOOD, E. ROBERTS (1985) ..... Aeronautical Engineering  
B.C.E., Cornell University, 1951; M.Eng., Yale University, 1955; D.Eng., 1967. Professor and Department Head.
- WOOTEN, RUDY A. (1977) ..... Food Science and Nutrition  
B.S., University of Arizona, 1971; M.S., 1973; Ph.D., 1976. Professor.
- WORDEMAN, JOHN B. (1973) ..... Graphic Communication  
B.S., Carnegie-Mellon University, 1948; M.S., University of Rochester, 1971. Professor.
- WRIGHT, MARSHALL S., JR. (1960) ..... Chemistry  
B.A., Reed College, 1946, 1952; M.A., University of Oregon, 1949; additional graduate study, University of California, University of the Pacific, University of Oregon, Deutsche Sommerschule am Pazifik, University of Konstanz, West Germany. Associate Professor.
- WU, SING-CHOU (1969) ..... Statistics  
B.A., National Taiwan University, 1959; M.S., Utah State University, 1966; Ph.D., Colorado State University, 1970. Professor.
- WYSOCK, RAYMOND ANTHONY (1970) ..... Industrial Technology  
B.S., California State Polytechnic College, 1968; M.A., Fresno State College, 1969; Ed.D., Utah State University, 1972. Professor. Registered Professional Engineer, California.
- YALE, DONALD A. (1982) ..... Management  
B.S., University of Illinois, 1952; B.S., Johns Hopkins University, 1959; M.B.A., Harvard University, 1955; D.B.A., University of Colorado, 1978. Associate Professor.
- YAMADA, KERRY T. (1981) ..... Counseling Services  
B.S., Dakota Wesleyan University, 1952; M.A., University of South Dakota, 1960; Ph.D., Ottawa University, Canada, 1968. Director.
- YANG, ALAN I. (1981) ..... Student Life and Activities  
B.A., University of Hawaii, 1972; M.A., 1976; Ph.D., 1981. Assistant Director.
- YANG, DAVID J. (1972) ..... Information Systems  
B.A., Southern Illinois University, 1965; M.S., 1972. Manager Resource Management.
- YEH, CHUAN-SUNG (1970) ..... Electronic and Electrical Engineering  
B.S., Naval College of Technology, Taiwan, 1953; M.S., National Chiao-Tung University, Taiwan, 1964; M.E., McMaster University, Canada, 1966; Ph.D., 1969. Professor.
- YONEDA, STEVEN H. (1972) ..... Intercollegiate Athletics  
B.S., California State Polytechnic College, 1970; M.S. 1972; NATA Certified Athletic Trainer, 1975. Coach.
- YONG, YUEN-CJEN (1978) ..... Mechanical Engineering  
B.E., University of Malaya, 1969; M.E., University of California, Davis, 1977; Ph.D., 1984. Associate Professor.
- YOSHIMURA, MICHAEL A. (1975) ..... Biological Sciences  
B.A., Stanford University, 1970; M.S., University of Hawaii, 1972; Ph.D., University of Arizona, 1975. Professor.

**646 Faculty and Staff**

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ZAREK, DAVID S. (1971)	Student Health Services
B.A., University of Minnesota, 1962; B.S., 1963; M.D., 1965. Physician.	
ZAYED, AHMED I. (1980)	Mathematics
B.S., Cairo University, 1970; M.S., 1974; Ph.D., University of Wisconsin, 1979. Associate Professor.	
ZETZSCHE, JAMES B., JR. (1968)	Agricultural Engineering
B.S., Texas Technological College, 1962; M.S., 1967. Associate Professor. Registered Agricultural Engineer, California.	
ZEUSCHNER, RAYMOND F. (1980)	Speech Communication
A.B., University of California, Berkeley, 1966; M.A., San Francisco State College, 1968; Ph.D., University of California, Los Angeles, 1973. Professor.	
ZOHNS, MICHAEL D. (1974)	Ornamental Horticulture
B.S., California State Polytechnic College, 1972; M.S., 1975. Professor.	
ZUUR, THOMAS L. (1983)	Enrollment Support Services
B.S., Sonoma State College, 1967; M.P.A., University of San Francisco, 1981. Manager, Information Systems.	
ZWEIFEL, K. RICHARD (1972)	School of Architecture and Environmental Design
B.S.L.A., University of Wisconsin, 1970; M.S.L.A., 1975. Professor and Associate Dean. Registered Landscape Architect, California.	





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# Appendix

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## APPENDIX

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### CHANGES IN RULES AND POLICIES

Although every effort has been made to assure the accuracy of the information in this catalog, students and others who use this catalog should note that laws, rules, and policies change from time to time and that these changes may alter the information contained in this publication. Changes may come in the form of statutes enacted by the Legislature, rules and policies adopted by the Board of Trustees of The California State University, by the Chancellor or designee of The California State University, or by the President or designee of the institution. Further, it is not possible in a publication of this size to include all of the rules, policies and other information which pertain to the student, the institution, and The California State University. More current or complete information may be obtained from the appropriate department, school, or administrative office.

Nothing in this catalog shall be construed, operate as, or have the effect of an abridgment or a limitation of any rights, powers, or privileges of the Board of Trustees of The California State University, the Chancellor of The California State University, or the President of the campus. The Trustees, the Chancellor, and the President are authorized by law to adopt, amend, or repeal rules and policies which apply to students. This catalog does not constitute a contract or the terms and conditions of a contract between the student and the institution or The California State University. The relationship of the student to the institution is one governed by statute, rules, and policy adopted by the Legislature, the Trustees, the Chancellor, the President and their duly authorized designees.

### NONDISCRIMINATION POLICY

#### Sex

The California State University does not discriminate on the basis of sex in the educational programs or activities it conducts. Title IX of the Education Amendments of 1972, as amended, and the administrative regulations adopted thereunder prohibit discrimination on the basis of sex in education programs and activities operated by California Polytechnic State University, San Luis Obispo. Such programs and activities include admission of students and employment. Inquiries concerning the application of Title IX to programs and activities of California Polytechnic State University, San Luis Obispo may be referred to the Director, Judicial Affairs, the campus officer assigned the administrative responsibility of reviewing such matters or to the Regional Director of the Office of Civil Rights, Region 9, 1275 Market Street, 14th Floor, San Francisco, California 94103.

#### Handicap

The California State University does not discriminate on the basis of handicap in admission or access to, or treatment or employment in, its programs and activities. Section 504 of the Rehabilitation Act of 1973, as amended, and the regulations adopted thereunder prohibit such discrimination. E. Douglas Gerard, Executive Dean, has been designated to coordinate the efforts of California Polytechnic State University, San Luis Obispo to comply with the Act in its implementing regulations. Inquiries concerning compliance may be addressed to him.

#### Race, Color, or National Origin

The California State University complies with the requirements of Title VI of the Civil Rights Act of 1964 and the regulations adopted thereunder. No person shall, on the grounds of race, color, or national origin be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program of The California State University.

### SEXUAL HARASSMENT POLICY

The Chancellor's Office of The California State University has published in Executive Order No. 345, dated June 1, 1981, a policy statement which is compatible with guidelines promulgated by the Federal Equal Employment Opportunity Commission. It is important that a working and learning environment exist that is free from sexual harassment of its students, employees and those who apply

for student or employee status. Sexual harassment includes such behavior as sexual advances, request for sexual favors and other verbal or physical conduct of a sexual nature directed towards an employee, student or applicant when one or more of the following circumstances are present:

- Submission to or toleration of the conduct is an explicit or implicit term or condition of appointment employment, admission or academic evaluation;
- Submission to or rejection of such conduct is used as a basis for a personnel decision or academic evaluation affecting an individual;
- The conduct has the purpose or effect of interfering with an employee's work performance, creating an intimidating, hostile, offensive or otherwise adverse working environment;
- The conduct has the purpose or effect of interfering with a student's academic performance creating an intimidating, hostile, offensive or otherwise adverse learning environment or adversely affecting any student.

Sexual harassment will not be tolerated by the university. Those guilty of sexual harassment will be subject to disciplinary action pursuant to the Campus Administrative Manual (CAM) Section 345.5, Education Code Section 89535 and 89542.5, or Administrative Bulletins 76-7 (Interim Disciplinary Action Procedures for Academic Personnel of The California State University) dated December 11, 1980; Administrative Bulletin 72-4 (Student Disciplinary Procedures of The California State University) dated March 20, 1972, as appropriate. Administrative Bulletin 77-1 (Grievance Procedures for Nonacademic and Administrative Employees of The California State University) dated March 15, 1977; and Administrative Bulletin 78-1 (Grievance Procedures for Academic Personnel of The California State University) dated November 1, 1978, are also available to those experiencing sexual harassment.

Those who perceive sexual harassment are encouraged to take the responsibility to indicate to the aggressor that such behavior is not tolerated. However, inability or failure to do so shall not preclude further action. Complaints alleging sexual harassment of employees or applicants for employment should be made to the Affirmative Action Coordinator or the Director of Personnel Relations. Complaints involving sexual harassment of students should be made to the Associate Dean of Students or the Associate Dean of Women. Such complaints will be investigated without delay and appropriate action taken. Counseling regarding the procedures to follow in filing a written complaint involving sexual harassment may be obtained from either the Affirmative Action Coordinator (546-2062, Administration 110), the Director of Personnel Relations (546-2844, Administration 110), the Associate Dean of Students (546-1521, Administration 209) or the Associate Dean of Women (546-1521, Administration 209).

## PRIVACY RIGHTS OF STUDENTS IN EDUCATION RECORDS

The federal Family Educational Rights and Privacy Act of 1974 (20 U.S.C. 1232g) and regulations adopted thereunder (45 C.F.R. 99) and California *Education Code* Section 67100 et seq., set out requirements designed to protect the privacy of students concerning their records maintained by the campus. Specifically, the statute and regulations govern access to student records maintained by the campus, and the release of such records. In brief, the law provides that the campus must provide students access to records directly related to the student and an opportunity for a hearing to challenge such records on the grounds that they are inaccurate, misleading or otherwise inappropriate. The right to a hearing under the law does not include any right to challenge the appropriateness of a grade as determined by the instructor. The law generally requires that written consent of the student be received before releasing personally identifiable data about the student from records to other than a specified list of exceptions. The institution has adopted a set of policies and procedures concerning implementation of the statutes and the regulations on the campus. Copies of these policies and procedures may be obtained at the Judicial Affairs Office. Among the types of information included in the campus statement of policies and procedures are: 1) the types of student records and the information contained therein; 2) the official responsible for the maintenance of each type of record; 3) the location of access lists which indicate persons requesting or receiving information from the record; 4) policies for reviewing and expunging records; 5) the access rights of students; 6) the procedures for challenging the content of student records; 7) the cost which will be charged for reproducing copies of records; and 8) the right of the student to file a complaint with the

Department of Education. An office and review board have been established by the Department to investigate and adjudicate violations and complaints. The office designated for this purpose is: The Family Educational Rights and Privacy Act Office (FERPA), U.S. Department of Education, 330 "C" Street, Room 4511, Washington, D.C. 20202.

The campus is authorized under the Act to release "directory information" concerning students. "Directory information" includes the student's name, address, telephone listing, date and place of birth, major field of study, participation in officially recognized activities and sports, weight and height of members of athletic teams, dates of attendance, degrees and awards received, and the most recent previous educational agency or institution attended by the student. The above designated information is subject to release by the campus at any time unless the campus has received prior written objection from the student specifying information which the student requests not be released. Written objections should be sent to the Director, Judicial Affairs.

The campus is authorized to provide access to student records to campus officials and employees who have legitimate educational interests in such access. These persons are those who have responsibilities in connection with the campus' academic, administrative or service functions and who have reason for using student records connected with their campus or other related academic responsibilities.

## USE OF SOCIAL SECURITY NUMBER

Applicants are required to include their Social Security account number in designated places on applications for admission pursuant to the authority contained in Title 5, *California Administrative Code*, Section 41201. The Social Security account number is used as a means of identifying records pertaining to the student as well as identifying the student for purposes of financial aid eligibility and disbursement and the repayment of financial aid and other debts payable to the institution.

## CAREER PLACEMENT

The campus may furnish, upon request, information about the employment of students who graduate from programs or courses of study preparing students for a particular career field. This information includes data concerning the average starting salary and the percentage of previously enrolled students who obtained employment. The information may include data collected from either graduates of the campus or graduates of all campuses in The California State University.

## STUDENT DISCIPLINE

Inappropriate conduct by students or by applicants for admission is subject to discipline as provided in Sections 41301 through 41304 of Title 5, *California Administrative Code*. These sections are as follows:

Article 1.1, Title 5, *California Administrative Code*

**41301. Expulsion, Suspension and Probation of Students.** Following procedures consonant with due process established pursuant to Section 41304, any student of a campus may be expelled, suspended or placed on probation or given a lesser sanction for one or more of the following causes which must be campus related:

- (a) Cheating or plagiarism in connection with an academic program at a campus.
- (b) Forgery, alteration or misuse of campus documents, records, or identification or of knowingly furnishing false information to a campus.
- (c) Misrepresentation of oneself or of an organization to be an agent of a campus.
- (d) Obstruction or disruption, on or off campus property, of the campus educational process, administrative process, or other campus function.
- (e) Physical abuse on or off campus property of the person or property of any member of the campus community or of members of his or her family or the threat of such physical abuse.
- (f) Theft, of, or non-accidental damage to, campus property, or property in the possession of, or owned by, a member of the campus community.



- (g) Unauthorized entry into, unauthorized use of, or misuse of campus property.
- (h) On campus property, the sale or knowing possession of dangerous drugs, restricted dangerous drugs, or narcotics as those terms are used in California statutes, except when lawfully prescribed pursuant to medical or dental care, or when lawfully permitted for the purpose of research, instruction or analysis.
- (i) Knowing possession or use of explosives, dangerous chemicals or deadly weapons on campus property or at a campus function without prior authorization of the campus president.
- (j) Engaging in lewd, indecent, or obscene behavior on campus property or at a campus function.
- (k) Abusive behavior directed toward, or hazing of, a member of the campus community.
- (l) Violation of any order of a campus president, notice of which had been given prior to such violation and during the academic term in which the violation occurs, either by publication in the campus newspaper, or by posting on an official bulletin board designated for this purpose, and which order is not inconsistent with any of the other provisions of this Section.
- (m) Soliciting or assisting another to do any act which would subject a student to expulsion, suspension or probation pursuant to this Section.
- (n) For purposes of this Article, the following terms are defined:
  - (1) The term "member of the campus community" is defined as meaning California State University and Colleges Trustees, academic, non-academic and administrative personnel, students, and other persons while such other persons are on campus property or at a campus function.
  - (2) The term "campus property" includes:
    - (A) real or personal property in the possession of, or under the control of, the Board of Trustees of the California State University and Colleges, and
    - (B) all campus feeding, retail, or residence facilities whether operated by a campus or by a campus auxiliary organization.
  - (3) The term "deadly weapons" includes any instrument or weapon of the kind commonly known as a blackjack, sling shot, billy, sandclub, sandbag, metal knuckles, any dirk, dagger, switch-blade knife, pistol, revolver, or any other firearm, any knife having a blade longer than five inches, any razor with an unguarded blade, and any metal pipe or bar used or intended to be used as a club.
  - (4) The term "behavior" includes conduct and expression.
  - (5) The term "hazing" means any method of initiation into a student organization or any pastime or amusement engaged in with regard to such an organization which causes, or is likely to cause, bodily danger, or physical or emotional harm, to any member or the campus community; but the term "hazing" does not include customary athletic events or other similar contests or competitions.
- (o) This Section is not adopted pursuant to *Education Code* Section 89031.
- (p) Notwithstanding any amendment or repeal pursuant to the resolution by which any provision of this Article is amended, all acts and omissions occurring prior to that effective date shall be subject to the provisions of this Article as in effect immediately prior to such effective date.

**41302. Disposition of Fees: Campus Emergency; Interim Suspension.** The President of the campus may place on probation, suspend, or expel a student for one or more of the causes enumerated in Section 41301. No fees or tuition paid by or for such student for the semester, quarter, or summer session in which he or she is suspended or expelled shall be refunded. If the student is readmitted before the close of the semester, quarter, or summer session in which he or she is suspended, no additional tuition or fees shall be required of the student on account of the suspension.

During periods of campus emergency, as determined by the President of the individual campus, the President may, after consultation with the Chancellor, place into immediate effect any emergency regulations, procedures, and other measures deemed necessary or appropriate to meet the emergency, safeguard persons and property, and maintain educational activities.

The President may immediately impose an interim suspension in all cases in which there is reasonable cause to believe that such an immediate suspension is required in order to protect lives or property and to insure the maintenance of order. A student so placed on interim suspension shall be given prompt notice of charges and the opportunity for a hearing within 10 days of the imposition of interim suspension. During the period of interim suspension, the student shall not, without prior written permission of the President or designated representative, enter any campus of the California State University and Colleges other than to attend the hearing. Violation of any condition of interim suspension shall be grounds for expulsion.

**41303. Conduct by Applicants for Admission.** Notwithstanding any provision in this Chapter 1 to the contrary, admission or readmission may be qualified or denied to any person who, while not enrolled as a student, commits acts which, were he enrolled as a student, would be the basis for disciplinary proceedings pursuant to Sections 41301 or 41302. Admission or readmission may be qualified or denied to any person who, while a student, commits acts which are subject to disciplinary action pursuant to Section 41301 or Section 41302. Qualified admission or denial of admission in such cases shall be determined under procedures adopted pursuant to Section 41304.

**41304. Student Disciplinary Procedures for the California State University and Colleges.** The Chancellor shall prescribe, and may from time to time revise, a code of student disciplinary procedures for the California State University and Colleges. Subject to other applicable law, this code shall provide for determinations of fact and sanctions to be applied for conduct which is a ground of discipline under Sections 41301 or 41302, and for qualified admission or denial of admission under Section 41303; the authority of the campus President in such matters; conduct related determinations on financial aid eligibility and termination; alternative kinds of proceedings, including proceedings conducted by a Hearing Officer; time limitations; notice; conduct of hearings, including provisions governing evidence, a record, and review; and such other related matters as may be appropriate. The Chancellor shall report to the Board his actions taken under this section.

Among the specific causes for which the University will take such disciplinary action are: the bringing or drinking of alcoholic beverages on campus; being intoxicated on campus; repeated violations of campus rules and regulations, including those pertaining to driving and parking of vehicles.

In accordance with provisions of Section 41301 above, the President has issued and posted officially an order which prohibits the consumption, possession, or use of alcoholic beverages on campus. Students who violate this order are subject to the penalties provided for in Sections 41301 and 41302, Title 5 of the *California Administrative Code*.

Disciplinary action varies with the severity of the violation. If the unacceptable behavior involves use of motor vehicles, the student may be restricted from driving or parking on campus. If the unacceptable behavior involves matters pertaining to on-campus housing or dining, the student may be restricted from living or dining on campus.

## INSTITUTIONAL AND FINANCIAL ASSISTANCE

The following information concerning student financial assistance may be obtained from the Director, Financial Aid, Administration 213, 546-2927:

1. student financial assistance programs available to students who enroll at Cal Poly;
2. the methods by which such assistance is distributed among student recipients who enroll at Cal Poly;
3. the means, including forms, by which application for student financial assistance is made and requirements for accurately preparing such application;
4. the rights and responsibilities of students receiving financial assistance; and
5. the standards which the student must maintain in order to be considered to be making satisfactory progress for the purpose of establishing and maintaining eligibility for financial assistance.

The following information concerning the cost of attending Cal Poly is available from the Director, Financial Aid, Administration 213, 546-2927:

1. fees and tuition (where applicable);
2. estimated costs of books and supplies;
3. estimates of typical student room and board costs or typical commuting costs;
4. any additional costs of the program in which the student is enrolled or expresses a specific interest.

Information concerning the refund policy of Cal Poly for the return of unearned tuition and fees or other refundable portions of costs is available from the Registrar, Administration 219, 546-2541.

Information concerning the academic programs of Cal Poly may be obtained from the Provost, Administration 305, 546-2186. This information may include:

1. the current degree programs and other educational and training programs;
2. the instructional, laboratory, and other physical plant facilities which relate to the academic program;
3. the faculty and other instructional personnel;
4. data regarding student retention at Cal Poly and, if available, the number and percentage of students completing the program in which the student is enrolled or expressed interest;
5. the names of associations, agencies, or governmental bodies which accredit, approve, or license the institution and its programs, and the procedures under which any current or prospective student may obtain or review upon request a copy of the documents describing the institution's accreditation, approval, or licensing.

Information regarding special facilities and services available to handicapped students may be obtained from Disabled Student Services, University Union 103, 546-1395.

## AVERAGE ANNUAL COST OF EDUCATION AND SOURCES OF FUNDS PER FULL-TIME EQUIVALENT STUDENT

The 19 campuses and the Chancellor's Office of The California State University are financed primarily through funding provided by the taxpayers of California. The total State appropriation to the CSU for 1985-86, including capital outlay and employee compensation increases, is \$1,344,407,000. The total cost of education for CSU, however, is \$1,419,772,444 which provides support for a projected 242,870 full-time equivalent (FTE <sup>a</sup>) students.

The total cost of education in the CSU is defined as the expenditures for current operations, including payments made to the students in the form of financial aid, including all fully reimbursed programs contained in State appropriations, but excluding capital outlay appropriations. The average cost of education is determined by dividing the total cost by the total FTEs. The average cost is further differentiated into three categories: State Support (the State appropriation, excluding capital outlay), Student Fee Support, and Support from Other Sources (including Federal Funds).

Thus, excluding costs which relate to capital outlay (i.e., building amortization), the average cost of education per FTE student is \$5,846. Of this amount, the average student fee support per FTE is \$858. The calculation for this latter amount includes the amount paid by nonresident students.

### Source of Funds and Average Costs for 1985/86 CSU Budget (Projected Enrollment: 242,870 FTE)

	Amount	Average Cost Per Student (FTE)	Percentage
Total Cost of Education .....	\$1,419,772,444 <sup>b</sup>	\$5,846	100.0
-State Appropriation .....	1,032,103,683 <sup>c</sup>	4,250	72.7
-Student Fee Support .....	208,302,903	858 <sup>d</sup>	14.7
-Support from Other Sources .....	179,365,858	738	12.6

<sup>a</sup> For budgetary purposes, full-time equivalent (FTE) translates total head count into total academic student load equivalent to 15 units per term. Some students enroll for more than 15 units; some students enroll for fewer than 15 units.

<sup>b</sup> The total cost of education does not include the amount related to the capital investment of the CSU. The estimated replacement cost of all the system's permanent facilities and equipment on the 19 campuses is currently valued at \$4.6 billion, excluding the cost of land.

<sup>c</sup> This figure does not include the capital outlay appropriation of \$60,831,000.

<sup>d</sup> The average costs paid by a student include the State University Fee, Student Services Fee, Application Fee, Catalog Fee, and Nonresident Tuition. Individual students may pay less than \$858 depending on whether they are part-time, full-time, resident or nonresident students.



# NORTH

*A harmony of technologies*



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Crops Unit(17) .....	*
Dairy Unit(18) .....	*
Davidson Music Center(45) .....	FG5
Dexter Building(34) .....	DE2
Dining, University Complex(19) .....	F4
Dining, Vista Grande(112) .....	G6
El Corral Bookstore(65) .....	F4,5
Engineering(13) .....	D2
Engineering East(20) .....	EF3
Engineering West(21) .....	E2
English(22) .....	D4
Erhart Agriculture(10) .....	D3,4
Faculty Offices(47) .....	D4,5
Farm Shop(09) .....	B3
Feed Mill(23) .....	B5
Fisher Science Hall(33) .....	D5
Food Processing(24) .....	C3
Graphic Arts(26) .....	F3
Gymnasium, Crandall(60) .....	E2
Gymnasium, Main(42) .....	G4,5
Health Center(27) .....	G3
Heron Hall(117) .....	G1
Hillcrest(81) .....	E5
Horse Unit(32) .....	*
Horseshoeing Unit(30) .....	B6
Housing Office(29) .....	E6
Jespersen Hall(116) .....	G1
Kennedy Library(35) .....	D2
Library, Kennedy(35) .....	D2
Lost & Found(70) .....	C5
Machine Shop(36) .....	C4
Maintenance and Receiving Warehouse(70) .....	C5

Mariposa Hall(93) .....	D1
Mathematics and Home Economics(38) .....	DE3
McPhee University Union(65) .....	F4,5
Meats Unit(39) .....	A6
Mechanical Engineering(40) .....	F3
Modoc Hall(119) .....	D1
Music Center, Davidson(45) .....	FG5
Mustang Stadium(61) .....	F1
Natatorium(46) .....	F1,2
Old Power Plant(76) .....	F2
Ornamental Horticulture Unit(48) .....	*
Physical Education(42) .....	G4,5
Plumas Hall(91) .....	D1
Poultry Unit(50) .....	*
President's Home(51) .....	G2
Public Safety(74) .....	C4
Rodeo Arena .....	B1
Rose Parade Building(78) .....	B4
Science(52) .....	EF4
Science Hall, Fisher(33) .....	D5
Science North(53) .....	D4
Sheep Unit(54) .....	B2
Stadium, Mustang(61) .....	F1
Swine Unit(56) .....	*
Tehama Hall(94) .....	D1
Temporary Faculty Offices: 26A, B, C, D .....	F3
48A .....	*
52T .....	E4
76B, C, H, J .....	F2
Theatre(44) .....	F5
Transportation Services(71) .....	C5,6
University Dining Complex(19) .....	F4
University Police/Fire(74) .....	C4
University Union, McPhee(65) .....	F4,5
Vista Grande Restaurant and Dining(112) .....	G6
Welding Shop(58) .....	C4

POLICE AND FIRE ..... See Public Safety

\*off map

## RESIDENCE HALLS

Diablo Hall(101) .....	D5,6
Freemont Hall(109) .....	F6
Lassen Hall(104) .....	D5
Muir Hall(107) .....	EF6
Palomar Hall(102) .....	D6
Santa Lucia Hall(106) .....	E5,6
Sequoia Hall(108) .....	F6

Shasta Hall(100) .....	D5
Sierra Madre Hall(113) .....	G6,7
Tenaya Hall(110) .....	F6
Trinity Hall(105) .....	E6
Whitney Hall(103) .....	D6
Yosemite Hall(114) .....	H7





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